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SCIENTIFIC Machine Tool Research

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IN THE *American Machinist*, on page 462, Vol. 72, there appears an article under the title "Support for Machine Tool Research." Surprisingly enough, it holds that American research on this subject is still in the kindergarten stage, and that American manufacturers of machine tools seem to have little interest in the researches undertaken at technical universities. This is not true of German manufacturers. It may, therefore, be of interest to show what has been done along this line during the past 25 years at Charlottenburg Technical University.

Among our first investigations was that of the lathe.

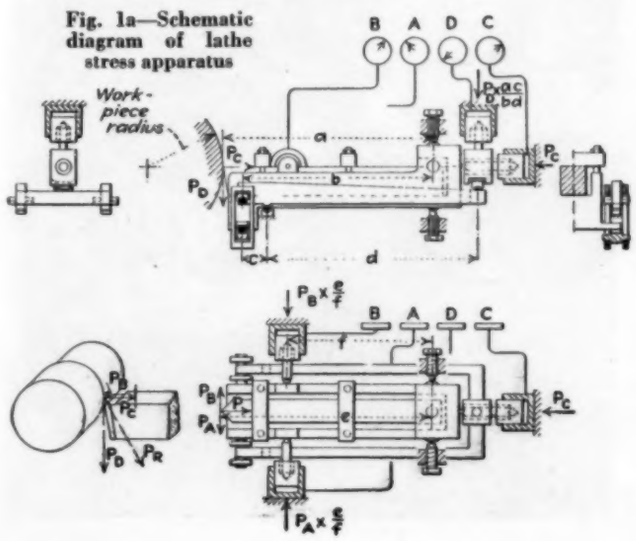


Fig. 1a—Schematic diagram of lathe stress apparatus

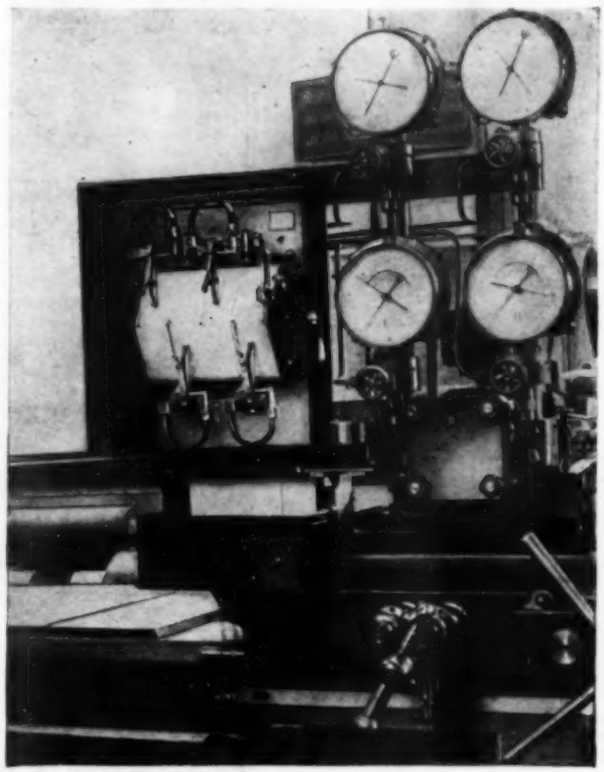


Fig. 1—Lathe set-up for measuring cutting pressures

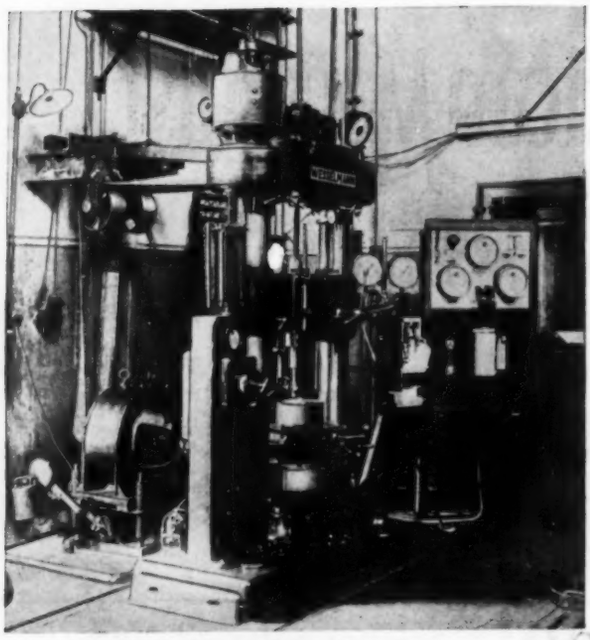


Fig. 2—Two-column drill press set-up

The set-up is shown in Fig. 1, with a schematic diagram in Fig. 1a. The investigations on drill presses are shown in Figs. 2 and 3, Fig. 2 showing a so-called two-column drill press driven by a 15-hp. motor, which bores up to 40 mm. diameter. Fig. 3 shows the measuring means for testing drilling on a small machine, capable of drilling between 1 and 8 mm. diameter at revolutions up to 20,000 r.p.m. The experimental apparatus, shown in Fig. 2a, consists of a measuring table which carries a hydraulic cylinder for measuring perpendicular feeding pressures and two hydraulic cylinders for measuring turning moment. In this manner, the work of the machine is easily plotted in diagrammatic form.

Shaper, planer, and miller set-ups are shown in Figs. 4, 4a, 5, 7, and 7a. The great difficulty in measuring the components of the cutting pressures on a milling machine results from the fact that the work tool turns around an instantaneous center. In order to investigate millers with screw-form teeth, it is, therefore, necessary

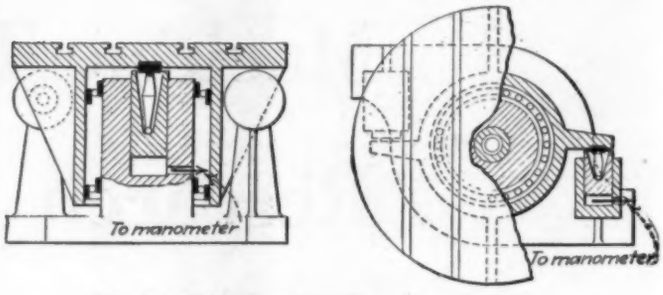


Fig. 2a—Table arrangement on two-column press

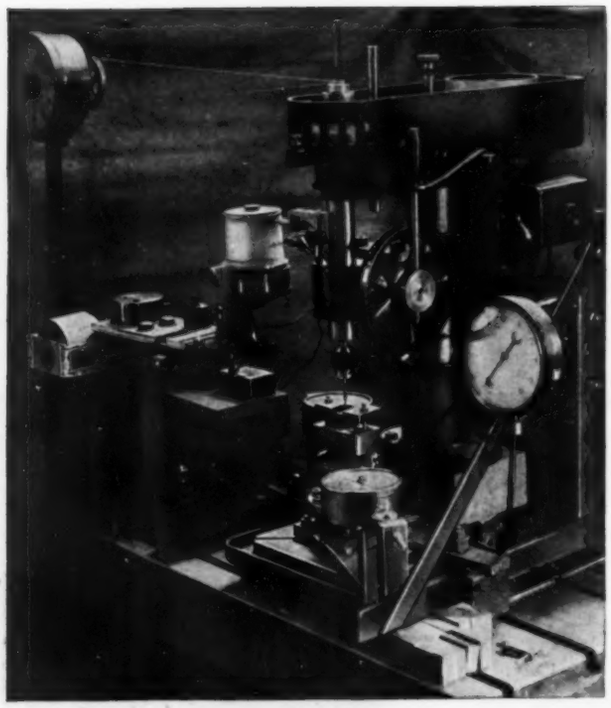


Fig. 3—Stress measurement on a small drill press

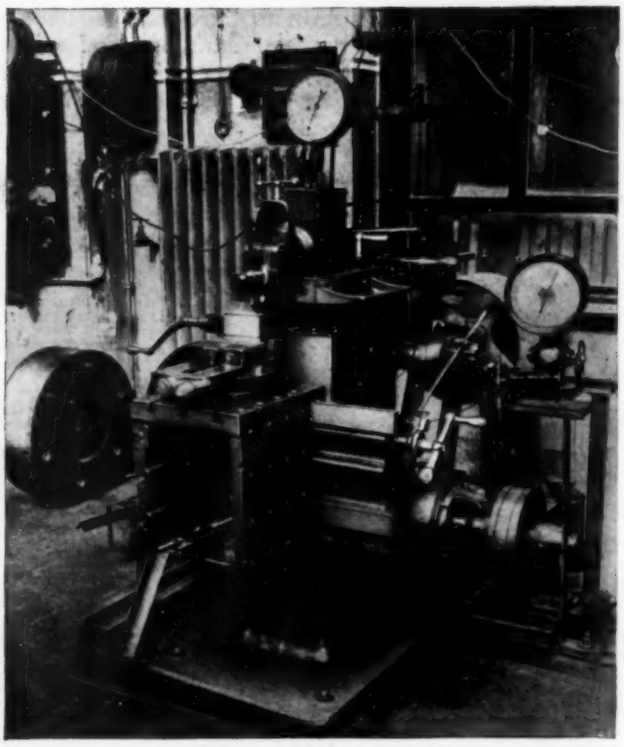


Fig. 4—The set-up for measuring shaper cutting forces

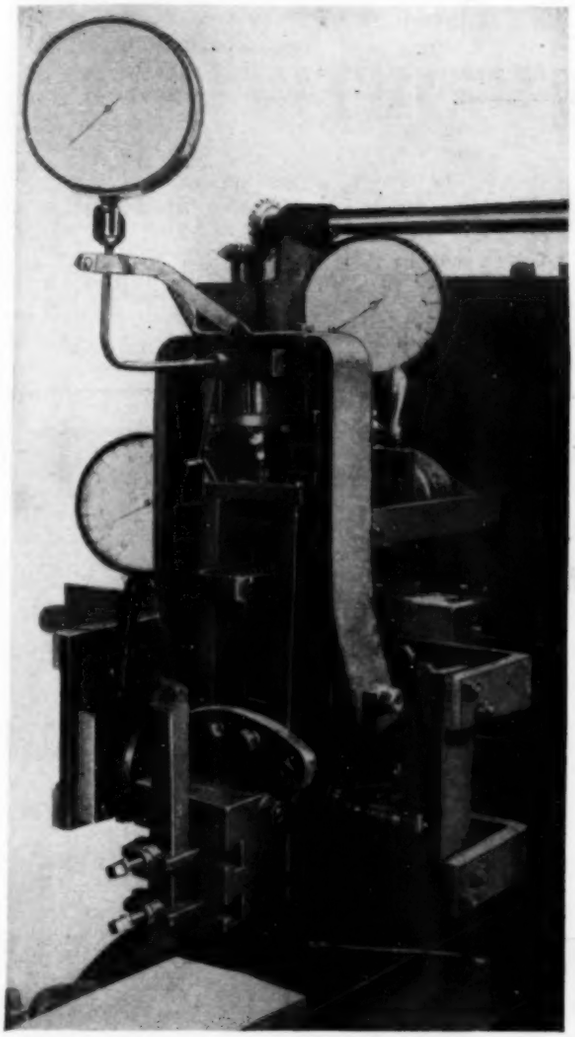


Fig. 5—Planer set-up, showing gages and tool pressure measuring arrangement

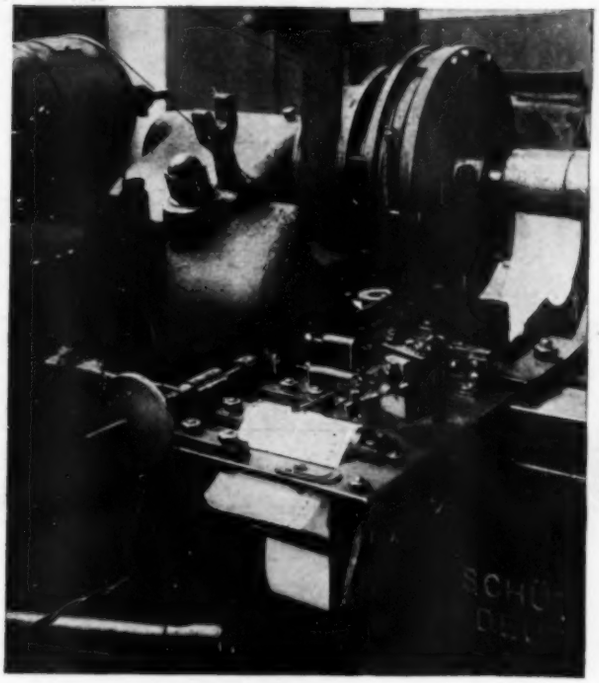


Fig. 6—Apparatus for investigating cylindrical grinders

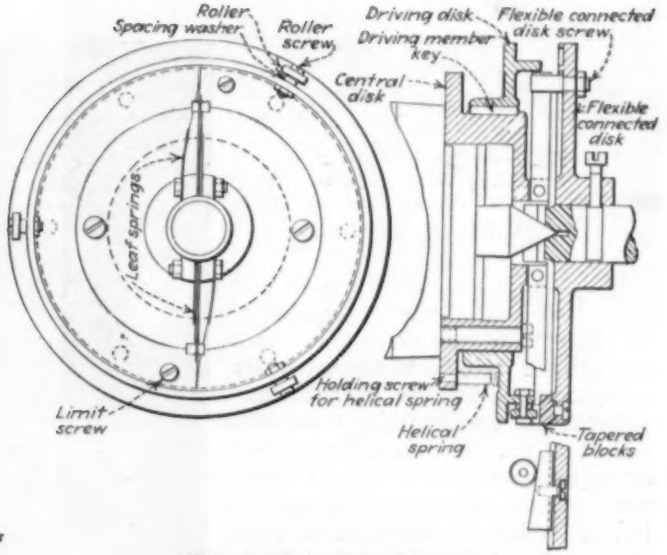


Fig. 6a—Schematic diagram of dynamometer used in grinding measurements

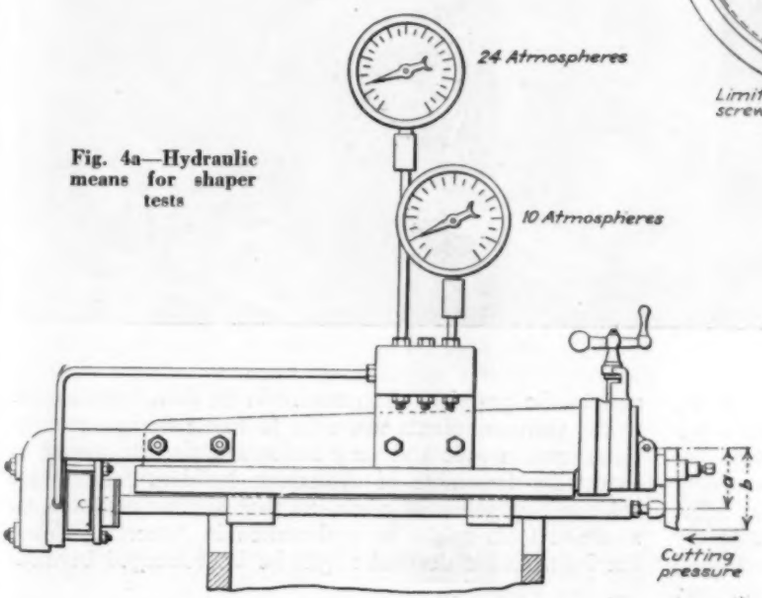


Fig. 4a—Hydraulic means for shaper tests

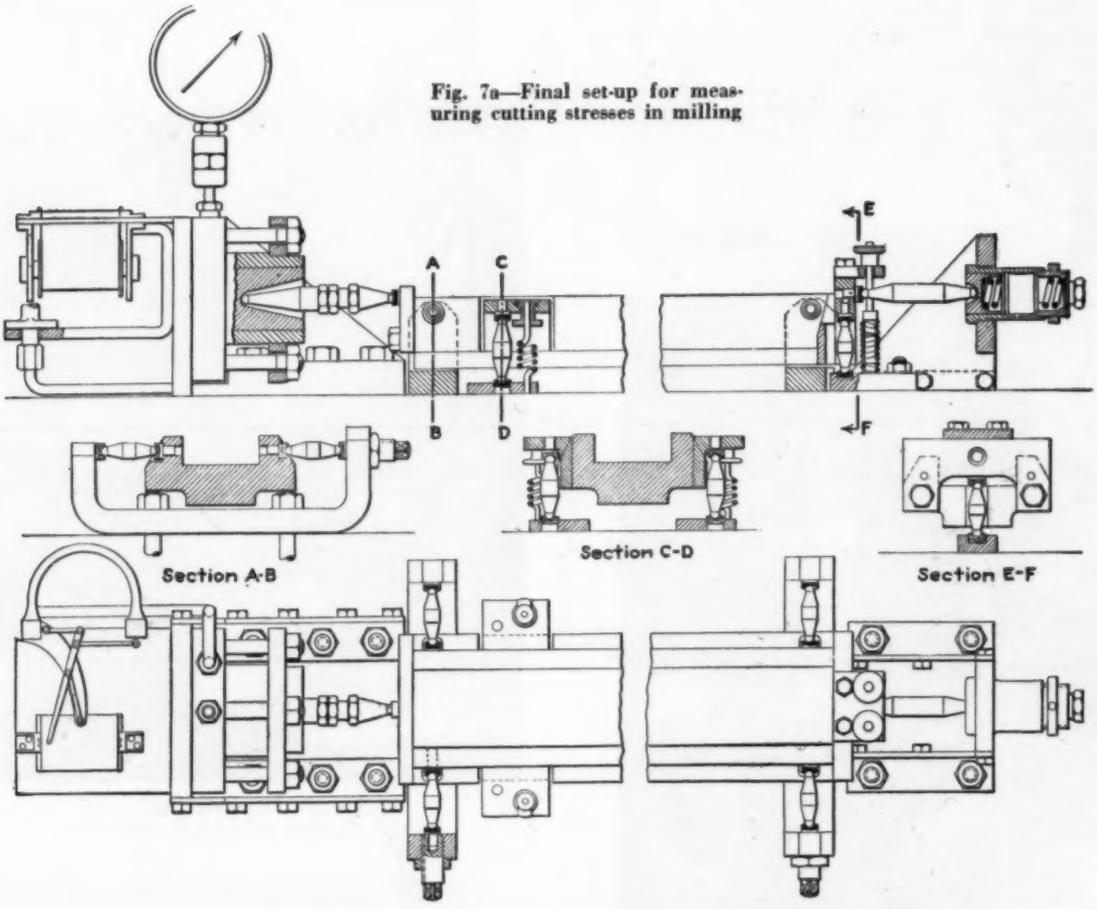


Fig. 7a—Final set-up for measuring cutting stresses in milling

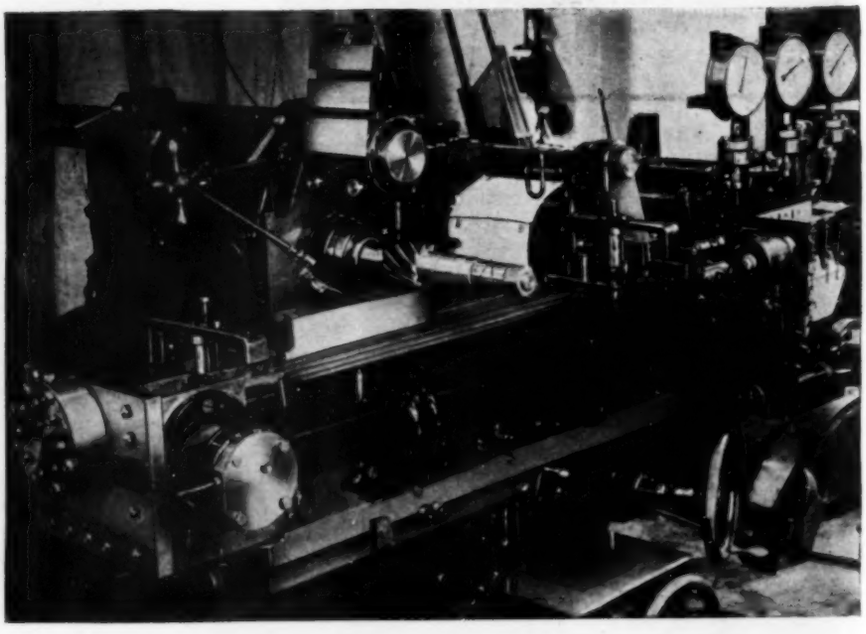


Fig. 7—Original set-up for measuring milling pressures

to place the table on two equal scales at right angles to each other, so constructed that no disturbing vibrations will be set up. The simplified milling arrangement shown in Fig. 7a measures only the perpendiular pressures, but is sufficiently accurate in most cases, since we found that these pressures usually composed 90 to 95 per cent of the total.

Figs. 6 and 6a show the apparatus for measuring the forces in cylindrical grinding. Here the forces are very moderate, varying between 5 and 60 kilograms, but the velocity is high, varying between 30 and 60 meters per second. In order to measure the small forces, the Bauart-Kurrein mechanical torsion dynamometer may be used. This arrangement I began to develop in 1905. From 1911 on I worked with the assistance of Professor Kurrein, until at this time we have practical results and equipment available both to the construction designer and to the practical shop man. With this foundational work, German plants are able to make design calculations upon a safe and very rational basis. It would be extremely fortunate if American builders would also achieve this point of view, so that similar research on machine tools might be undertaken in America. Then the information derived might be interchanged between the two countries.

VITREOUS ENAMELING CAST IRON

C. D. CLAWSON
Superintendent, Chicago Vitreous Enamel Product Company

Adequate protection for the operator is necessary when sandblasting cast-iron parts. The apron is rubberized cloth, the mask fiber

THERE ARE TWO distinctly different methods of applying porcelain enamel on cast-iron parts. The first, known as the dry process, is a considerably older method, its present use being confined chiefly to bathroom fixtures or other very heavy castings of a similar nature. Enamel applied by the dry process method is very tough and very durable, probably due to the high temperature at which it is fired.

In the dry process, the casting to be enameled is carefully sandblasted, and a slush coat or ground coat is sprayed on and allowed to dry before firing. The casting is then placed in the furnace, usually a semi-muffle type, and the ground coat matured. When the casting has reached the proper degree of heat, it is removed and placed on a rotating table. Dry and finely powdered cover coat is then dusted on the hot casting, a large portion of the enamel adhering because the fine particles partially fuse on the hot surface. After a medium-heavy coating has been evenly applied, the casting is returned immediately to the furnace and the cover coat fused until a smooth, lustrous finish develops.

Because of the thick coat applied, only one cover coat is needed. If the casting is not thoroughly cleaned, or if the ground coat is not properly applied and fused, the enamel may not adhere firmly to the casting, and large sheets of enamel may flake off as the casting cools. Pin holes and black specks make their appearance for a number of reasons. With proper control, however, very excellent results may be obtanied by this process. The average fusing temperature of dry process enamels is between 1,700 and 1,800 deg. F. For this reason these enamels are not made from a majority of soft fluxes, such as is required in enamels of lower fusing temperatures, and the bond which develops is especially tough. Another probable reason for the durable quality of dry process enamels is the penetration of the ground coat into the surface of the casting as a result of these high temperatures.

Increase in the use of porcelain enamel on cast iron made it necessary to develop a more economical means of applying enamel on smaller castings. The result was the development of the wet process, now used almost exclusively in the enameling of the cast-iron parts used on stoves, heaters, furnaces, automobile manifolds, and similar units.

Castings to be enameled by the wet process must be thoroughly cleaned. Sandblasting is the most effective method and the safest, since no water is left in the pores as would be the case with a wet cleaning process. Sandblast tables with rotary grates and nozzles carrying sand and air under pressure are quite efficient, producing between 400 and 500 lb. of clean castings per hour with only one operator, whose chief duty is loading and unloading the exposed sector of the table. Small articles such as hinge covers, stove burners, and handles can best be cleaned in barrel-type sandblasters of the semi-automatic type. In these machines, the parts are tumbled while several jets of air and sand play upon them. Castings with thin sections that are easily broken cannot, of course, be handled in this manner. Probably the most common type of sandblast equipment is the cabinet type,

Photographs by courtesy of The Cribben & Sexton Company, Chicago.

but it is the least efficient because the operator is encumbered by goggles and sometimes a respirator.

The use of steel shot or abrasive is a comparatively recent development. Best results are obtained by blending a small amount of silica sand with the steel abrasive. The steel grit does not fracture readily upon impact, and for this reason the losses are reduced and the dust menace is lessened. It is poor practice to use steel grit in the sandblasting of sheet steel parts: in nearly every case the ware will develop copper heads upon re-enameling.

The stock room in which the raw castings are stored previous to sandblasting should be as dry as possible. Castings which have been very wet or which have been in a moist atmosphere will develop rust spots very quickly after sandblasting, owing to the water absorbed into the pores. The use of an excessive amount of grease or oil in any of the machining operations previous to sandblasting is also detrimental. This is especially true of stove parts which are drilled and tapped. The presence of moisture in the air used for sandblasting causes similar difficulties. This can be remedied by sufficient cooling and by expansion tanks.

There are certain formulas used for the manufacture of cast iron which produce castings that are difficult to enamel, and co-operation from the foundry is an essential factor. Proper location of the gates in the mold and pouring the casting with the face to be enameled down are important considerations. These precautions will reduce materially the number and size of the holes in the face of the casting. Oftentimes warpage which occurs in the fusing of the enamel can be corrected by a change in the design of the casting. The pattern should be made in such a manner that the minimum stresses will develop when the casting is heated. Another important consideration in the design of the casting is the avoidance of uneven sections: lugs and heavy portions of the casting should be kept at a minimum.

All sandblasted castings should be carefully inspected before spraying. Process inspection is one of the most important considerations in successful enameling. The ability to detect castings which should be returned to the sandblast comes only from experience. It is better to have an inspector who is too close than one who will pass questionable work. It is much less costly to re-sandblast at this point than to scrap the labor and material after several re-operations.

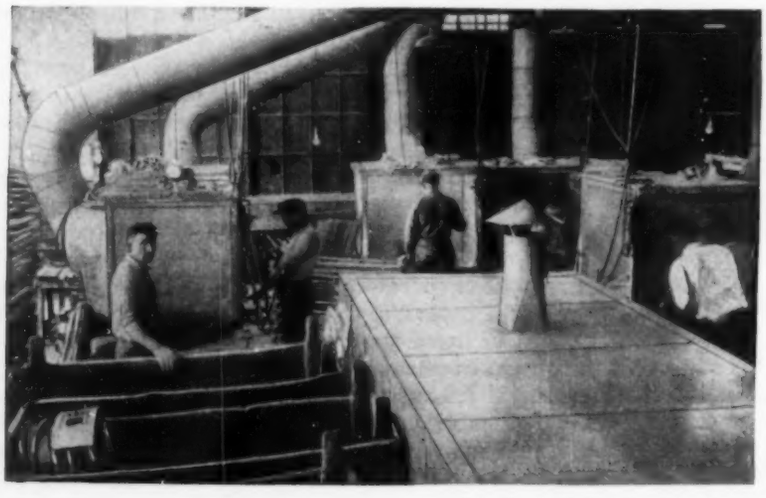
All castings which have not been properly cleaned should be returned to the sandblast room. Those found to be clean should be inspected for sandholes, fractures, rough surfaces, and other defects originating in the foundry. There are numerous patching compounds in use for filling sand holes, many of them being prepared from a mixture of silica, clay, and milled enamel. It is important that this compound be pressed firmly into the hole to be filled. If any unfilled space is left it is likely that the patch will blow out in the burning operation. The material may be used in a semi-liquid form or as a thick paste, and should be dried thoroughly before the ware is burned. If this is not done the generated steam may lift the material from the hole. The compound should be formulated in such a way that it will fuse completely in the first burning in order that blisters may not occur in later firings. Broken castings should be rejected for repair, or scrapped, as the cracks usually become worse when the enamel is applied. Rough surfaces on the casting should be filed down or "touched up" on a grinding wheel, otherwise these projections will show through the finish coat as discolored spots or streaks. Spraying cast-iron enamels requires considerable skill. The enamel in the spray pail should be as dry as possible. If the enamel is too thin, it will run toward the edges of the casting, forming a bead which will chip easily when handled after drying. It will also pit easily when sprayed too wet. These pits often burn through to the casting, causing black specks and blisters in the next coat. Another serious difficulty resulting from the use of enamel containing too much water is excessive rusting of the casting after it is sprayed. These rust spots appear as reddish brown discolorations after the first coat is burned, and are difficult to cover with another coat.

IN the majority of cases it is unnecessary to apply a ground coat. Better results and greater economy are obtained by applying one or two coats directly on the casting. If the casting is of a somewhat inferior grade, it may be advisable, however, to use a ground coat, applied in much the same manner as the first coats.

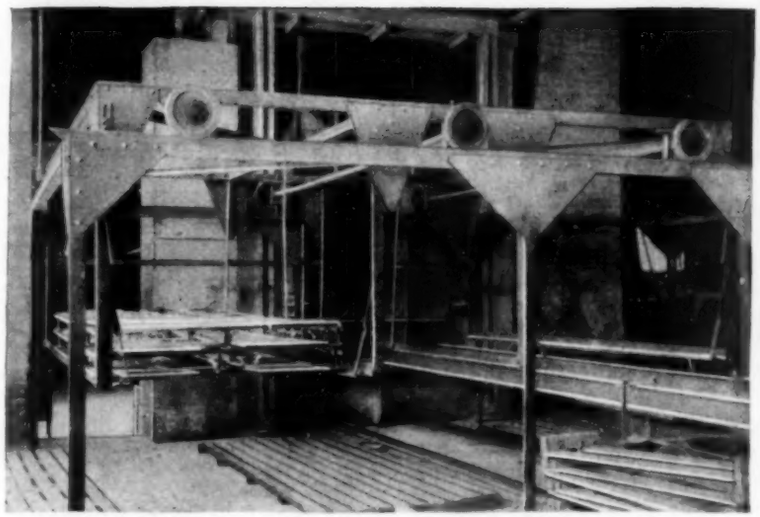
A frequent fault of sprayers is to spray too much enamel on the top surface and too little on the flanges or sides of the casting. A most satisfactory means of controlling this is to teach the operator the proper number of strokes with the spray gun required to apply the proper thickness of coat. In fact, it is advisable to teach a routine of spraying for each type of product.

After the enamel has been sprayed, it should be dried as rapidly as possible in order that rusting be kept at a minimum. Proper racks should be provided for each article. It is necessary to support the good edges of castings entirely clear of the boards; otherwise rough handling of the racks as they are moved about by truck will result in considerable chipping of these edges.

Burning of cast-iron enamels also requires considerable skill on the part of the burner. The furnace should be loaded uniformly and worked as nearly as possible at a uniform rate. Under ideal working conditions the input of heat, whether it be gas, oil, or electricity, should remain constant over long periods. Burning



Convenient grouping of five spray booths around the entrance of a dryer tunnel with power conveyor



Typical form of furnace charging equipment for cast-iron stove parts. The three decks of trays are built up as the shelf is loaded

equipment should be arranged to permit loading the maximum weight of product with the use of a minimum weight of burning equipment. A heavy load is desirable, with the pieces loaded as close together as convenient. The larger loads require considerably more time in the furnace. In this way sufficient time is allowed to bring the entire mass to a uniform temperature. If the time in the furnace is too short, the enamel will not fuse properly over the lugs and heavier sections of the castings.

The ware should be handled very carefully at the furnace, both before and after burning. Perspiration from the hands will produce discolored marks on the finished work.

It is also important to support the product on the burning tools in such a way as to prevent warping. This requires some experience, as certain castings may show a tendency to warp in a certain definite manner. Heavy ribs running along one side, or uneven sections, usually are the causes of this condition. In nearly every instance, however, this can be overcome by the proper location of the burning bars. It is also possible to correct warpage of this kind by changing the pattern design so that the stresses in the casting may be equalized. Sometimes warping may be the result of the removal of the casting from the sand in which it is poured before the strains have had sufficient time to adjust themselves while the metal is still hot.

After the burning of the ground coat, or first coat, the casting should be thoroughly inspected before respraying. If the enamel is blistered it may be due to under-burning or to poorly cleaned castings. In either case, the blistered piece should be reburned at a slightly higher temperature until smooth. If the blisters are due to dirt on the casting they may become worse with this treatment. Underburning, however, will, as a rule, be corrected in this manner.

If the ware has been slightly over-fired, the best practice is to apply the next coat without further treatment. If, however, the enamel has been over-fired to such an extent that the casting is exposed, it is best to return the piece to the sandblast room. If bare spots or chips appear, the scale should first be thoroughly removed from the surface with a file and then re-sprayed.

Production of enameled cast-iron parts can be greatly increased by the finishing of a large percentage of ware with only one application of enamel. The success of this process rests almost entirely with the supervision, as considerable skill and technique are required in every operation. The first step is to adjust the mill addition and milling practice to this end. Naturally the enamel must be more opaque. This is accomplished by an increase in the opacifier, or colder oxides, or by the use of a more opaque frit. It is advisable to increase the clay mill addition slightly and reduce the milling time to some extent

The sprayers must be trained to apply a uniform medium-heavy coat of enamel, using the least possible water in the spray pail. Too thin enamel will produce rust spots and will run from the high points of the casting into the depressions and form beads along the edges. The pitfalls to be avoided in the application of one-coat finish are as follows:

(1) Uneven spraying, corrected by proper instruction

(2) Tearing or cracking of the enamel when burned due to too heavy spraying or the use of an enamel containing too much water

(3) Blisters over the lugs and uneven sections resulting from improper burning.

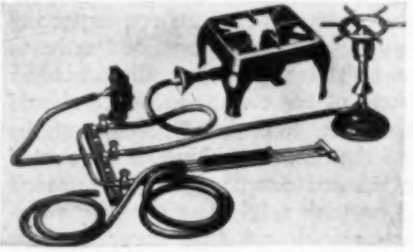
One-coat ware blisters easily unless properly fused. A maximum load should be burned and the temperature lowered about 20 deg. F. below that required for fusing two-coat ware.

■

A Convenient Source of Intense Heat

A GREAT deal of plant experimental work requires a small flame apparatus capable of producing an intense, yet perfectly controlled, heat. The outfit illustrated can be made into a portable unit very readily, and will produce a flame which reaches 3,300 deg. F. It consists of a hot plate, a Bunsen burner, an acetylene-and-air torch with air control, a reducing valve, a three-way branch valve, the necessary red gum tubing, and a small tank of dissolved acetylene.

Dissolved acetylene produces a higher temperature than coal or natural gas, yet forms a readily controlled flame which is non-oxidizing and non-carbonizing. In addition, it is far more readily transported about the shop in convenient tank form. The torch illustrated uses compressed air in addition to acetylene. The flame may be changed from the brush type to an intense needle point by adjusting the air supply. The brush, or Bunsen flame, has a temperature of approximately 2,800 deg. F., the needle point flame a temperature of approximately 3,300 deg. F. A wide latitude of temperature control is possible by adjustment of the gas pressure.



EXECUTIVE FORUM

Anticipation Without Realization

TWO years before, the Mid-City Machine Works had changed from private ownership to corporate control. While most of the shop personnel and many of the old executives had been retained under the new management, the former policies were gradually being supplanted.

"Could I see you for a few minutes, Mr. Coakley?" said John Galloway, the works manager, to Mid-City's president. "I had a comeback this morning on our new bonus ruling. Bill Collier, the turret lathe foreman, was in to see me. As you know, the old management gave a bonus of 100 dollars to each man who completed ten years of continuous service with the company. This was distributed about this time every year and Collier was the first man to apply for this share. He was very much upset when he found it had been discontinued."

"He naturally would be," said Coakley. "But as we get away from the practices of the old régime, we must expect a certain amount of discontent. That's why we're taking things slowly."

"This time it's more serious than may at first appear," said Galloway. "About a dozen men, three of them foremen, would be eligible for the bonus under the old ruling. Collier told me that every one of them is counting on it and pointed out that it was paid last year under the new management. It's important to retain the confidence of these men. Perhaps it would be well to reconsider our decision."

"Not for a minute," said Coakley, decisively. "These men have no basis for feeling the money is due them. It only confirms my belief that extra payments to special groups do more harm than good. The ten-year bonus was only one of many disbursements and gratuities set up in the past. I strongly advocate adequate pay for work well done as the basis of reward. Additional stipends founded on sentiment are not good business. They are a burden to the company and do not arouse any more interest on the part of the men."

"Collier claimed precedent as a reason for expecting his bonus," said Galloway. "He objects not only to losing the money but to the way it was discontinued. He feels that a statement of the change in policy should have been made if we were determined to cut out the payment. Then he and the others wouldn't have counted on it until they were turned down at the paymaster's window. Collier said he took a trip last summer anticipating the extra cash ahead and that several others made expenditures with the same thought in mind. When they are all turned down, they'll be a very discontented lot."

"They took a good deal for granted," said Coakley. "If the payment could in any sense be considered due these men, we would have certainly announced our plans. But a bonus is purely voluntary on the part of the management. As soon as it is regarded as a routine addition to wages to the extent of being spent in advance, it loses all value. I'll be glad when all the sentimental cobwebs of the old regime are finally cleaned up."

"In making these policy changes gradually, we admit a certain weakness in our stand," said Galloway. "We know that a complete change would cause serious trouble. We spread out the dissatisfaction more thinly, but still it is there. Sentiment is often valuable in business and should work both ways. We've tried to instill a spirit of loyalty in our men, but I don't think it's as great as formerly."

"The old crowd lost control of the business because profits fell off," said Coakley. "We can't stay in the same rut and expect to get anywhere."

■

What Do You Think About This Problem?

Send your views on special bonuses to *American Machinist*. Were the men in the example cited presumptuous in regarding the payment as due them? Do bonuses aid in creating a spirit of co-operation and loyalty or are they unbusiness-like relics of private management? Do employees respond to the stimulus of extra compensation or do they prefer to receive their earnings in current pay checks without a system of "deferred wages"?

. . . Discussion
of Executive Problems

Too Much Specialization?

There is something wrong with a system which prevents the use of men on work for which they are fitted and on which they are needed. An accounting department should be able to charge a man's time to any department on any kind of work. Then laborers can be borrowed from the transportation department for emergency work in the press shop and their time charged to the latter. The transportation foreman is then less concerned than he would be if the men were absent, as he knows they are being used for the good of the plant.

Perhaps many plants do not practice "farming out," that is, temporary transfers of men to other departments for a day or a few hours. This method is very convenient, as it permits keeping a plant well balanced. It should not be allowed to become too prevalent and nullify the real economies of specialization.

Nor should specialization be carried to the extent that there is no one to perform some unusual task except the foreman or superintendent when all the other men are on piecework. It is not unusual to see a high-priced foreman spending time on simple odd jobs, just because he is the only man who is not on piecework.

—HARRISON G. BROWN, *Supervisor of Standards, Crompton & Knowles Loom Works.*

Success or Successor?

Self-reliance and the ability to delegate responsibilities and duties are qualities too rare to pass unnoticed or unrewarded. The successful man will be found to be above all things "teachable." His mind is receptive to new ideas; these ideas he must have time to develop. The chief difficulty, which apparently stands in the way of making progress by many, is the fear of losing their jobs to the men below. But many progressive and successful men want to lose their jobs—and find higher posts.

Although it is true that firms cannot afford the expense of training and providing understudies, there are contingencies which must be taken into consideration. Vacation periods and absence through sickness must be provided for; they always cause dislocation. Hence the necessity for someone to be trained, in some measure at least, to carry on.

It is remarkable how often the manifestation of that human failing, that one is indispensable, obtrudes itself upon the attention. The plea usually put forward is that the job is unique in its difficulties. No man brought in from outside and unaware of its peculiarities would understand it like the present incumbent. This type of mind is difficult to develop. It regards success from a narrow angle. Such men do not—perhaps cannot—appreciate that their very busy manner and the meticulous care of details, which they must always personally supervise, are drawbacks.

The modern method of achieving progress is to eliminate detail work as much as possible. This can be done only by the delegation of duties and responsibilities. Obviously this end cannot be attained where a man wishes and endeavors to retain his knowledge to himself. The wise course is to develop the skill and interest of assistants. If possible give each one a definite responsibility corresponding to his special aptitude.

—J. W. PEPPERDINE, *Welfare Secretary, Barford & Perkins, Ltd., Peterborough, England*

Can Ideas Be Allocated?

The recovery of expenditure on development and drawings, as a direct charge against orders in progress, is perfectly sound and helps appreciably to reduce the general overhead charges of the factory. Nevertheless the method lends itself to certain abuses and should not be employed unless the following conditions are observed:

(a) Cost of development and drawings are treated as a direct charge in the original estimate.
(b) Time booked is authenticated either by using a time recorder clock or controlled by a time clerk.
(c) Some measure of efficiency is essential either in the form of an estimate, a predetermined cost, or some other reliable standard of value.

Unless the cost is a true record it is of very little value. When accurate direct booking is impossible, it is always safer to collect the charge in the form of overhead. Artificial systems of reducing overhead, based on guesswork booking or some arbitrary system of recovery, are particularly vicious.

Even if the full overhead is not recovered, it is better to see all factory expense in the expense schedule than to obscure the true facts by some rule-of-thumb method of recovering indirect expense as a direct charge. Much of the work undertaken by the drawing office is routine for which time could be set as easily as for a machine-shop operation. This would provide a standard for costing as well as a measure of drawing office output and would certainly help to cut out the unprofitable elaboration which is all too easily incurred.

—R. M. THOMPSON, *Leicester, England.*

Square Deal or New Deal?

Human nature being what it is, the executive who steps into a new job expecting the old timers of his new plant to welcome him with open arms is due for a shock and generally gets it. The first week or so is really the testing period in his relationship to his new subordinates, and should enable him reasonably to estimate the support he may expect in the future. If the least lack of co-operation is apparent, only quick action can determine his success or failure in his new post. A show-down with the "injured" party will often clear the air. If not,

drastic action is the only remedy, and the new broom should make a clean sweep of those who refuse to co-operate, though it may mean a loss of valuable experience.

Better a team of willing workers behind one, lacking in experience perhaps but pulling in the right direction, than a corps of dissatisfied and half-hearted experts. Results may be slower, but they will be more certain.

—Robert S. Alexander,
Universal Winding Company.

Concentration or Confabulation?

Concentration is essential if one is going to do anything or get anywhere. An executive can keep up personal contact without letting it interfere with business. There is nothing as distractful nor as wasteful to a busy executive as to allow the foreman to run in and let off steam over personal grievances or worries. He would be a poor executive to listen to company business from the foreman, while that foreman has an immediate superior. I personally think that the leader that holds personal contacts with his men accomplishes much more with them, but to allow it to interfere with his duties, is merely stealing the company's money in the form of wasted time. If he is the owner, he is simply robbing his own pocketbook. Everything must have a place, and the place for these contacts is at a set time. If this is followed out closely, there will be very little time wasted, as a man will be sure he has something to say before he makes an appointment.

—Charles R. Whitehouse, *Standards Engineer,*
The Holtzer-Cabot Electric Company.

The Urge to Merge

I believe small shops should merge, and by so doing, cut down their overhead. Every shop must have a bookkeeper. The same bookkeeper could take care of the work of four or five shops, depending on the size. When the work gets too heavy for him, a clerk could be put on to handle some of the work. The bookkeeper and clerk would not cost as much as two bookkeepers.

The same could be said of the shop. If you had only ten men, a foreman would be necessary, whereas the same foreman could supervise twenty or thirty men. If the work became too heavy for him, he could be given an assistant at a smaller salary than a foreman. Of course, if you are going to merge and retain all the men of both shops, I do not see any advantage to the scheme.

—J. Walter Wright, *Assistant to the President,*
Wilmot Fleming Iron & Steel Company.

Jigs By Whom?

The engineering department is the place where designing is done most profitably and intelligently, from an engineering standpoint. On the other hand, the works manager is responsible for the efficacy of operation of the shop as a whole and the ultimate cost of the product, which is largely dependent upon the tooling.

In modern industry, jig and fixture design is a specialized field, apart from general designing. A good machine designer is not necessarily a good jig and fixture designer, and vice versa. Hence the chief engineer's contention, that his men are acquainted with the engineering requirements of the parts, is not only weak but erroneous. The tendency of leaning toward the heavy side in designing jigs and fixtures is unfortunately only too often carried beyond good reason and is costing industry much wasted effort, energy, and money.

Another erroneous attitude of engineering departments is that they believe they know shop conditions. I, too, formerly cherished that attitude, but found that records and indices are valuable only as clerical information. It is one thing to read about these things and consult index cards; quite another to be in actual daily contact with the shop.

A tool design department, headed by a competent man, one who has had both drafting and shop experience, working in co-operation with the works manager, chief engineer, general foreman, chief inspector, and tool manufacturing foreman, will bring best results. He should, however, report directly to the works manager.

—George Belbes, *Production Engineer,*
The Gaertner Scientific Company.

Should Overhead Be Uniform?

The answer is decidedly in the negative. Serious miscalculation can ensue as a result of a blanketing overhead. The writer has in mind a set of tools, jigs, and some special machines installed for making a high class article in quantities. The cost of this equipment was so great that the selling heads had to be called into conference to get their assurance as to sales covering three years' turnover before sanctioning the purchase.

One day the general manager said: "There is a firm not far from here producing a machine and selling it for less than our machines are costing to make." Investigation showed that the same overhead was used for the product which compared unfavorably with competition as for the machines requiring expensive special equipment.

A system of costing, taking into account variations in production was considered and sanctioned. First, the cost of the buildings, power, light, and insurance was ascertained. The cost was then put on each machine according to the space occupied taking as a basis the assessed value of the machine with 10 per cent as depreciation and 5 per cent for interest. All the tools for the production of work of any character were allocated to the machine, their life ascertained, and a yearly amount charged.

The toolroom was placed on a manufacturing basis, that is, tools made were given a value at which they were sold to the machine. In short, after the system had been thoroughly installed it was found that each machine was carrying its load to an extent which included floor space, head room, power, light supplies, maintenance (including cleaning and oiling) labor employed on the machines, and a proportion of the foreman's time.

The administrative overhead was allocated to the productive machines when running and not charged over the idle time. This method enabled the managing director to get at the exact cost of any article being produced, and it was proved that the machine was actually being produced cheaper than that sold by the competitor. The price was reduced accordingly and a good turnover ensued. —A. T. Fann, *Huddersfield, England.*

HOW STEEL BENDS

C. B. DEAN

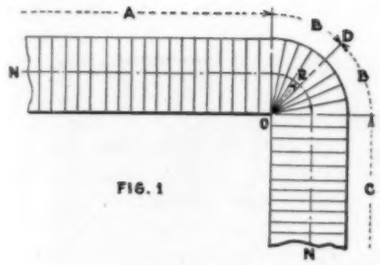


FIG. 1

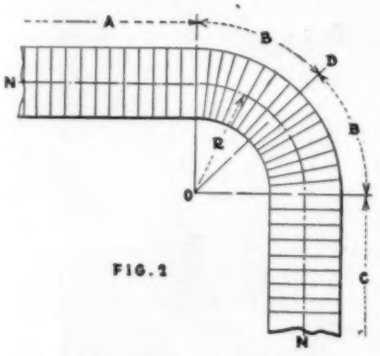


FIG. 2

IN THIS age, when new uses for steel are cropping up every day, any method or fact which saves labor and material is particularly welcome to steel men. One particular source of waste in both labor and material is a common lack of knowledge as to what actually happens when a section of iron or steel is bent.

Obviously, much time, trouble, and labor is saved when a steel plate or bar is accurately cut and all holes drilled or punched before the material is bent, pressed, or rolled. Often the completed shape cannot be punched and must be drilled with various setting-up operations. Needless excess material must be burned or chipped away if all necessary allowances are not made in the material before bending.

In bending very thin material, no allowances for the thickness of the material are necessary, but for heavy iron, they must be made. To make these allowances intelligently, a knowledge of the structural changes that take place in the material itself is required.

Figures 1 and 2 show two steel plates each bent to an angle of 90 degrees. In Figure 1, the bend is as square as it is humanly possible to make it. In Figure 2, the bend is of greater radius and of a kind that is common in industrial practice. Both figures illustrate the changes that take place in the structure of the material as it bends. The parallel lines crossing the straight portions of the figures and the radial lines crossing the curved portions show how the relative positions of the steel sections have altered during the operation. On the outside of the curve, the material has stretched or expanded while on the inside of the curve it has converged or contracted. Midway between the outer and inner curves is the neutral line, where the molecular arrangement remains as in the straight portions and as before the bending operation. It is this unchanging neutral line that is the basis of all calculations as to the amount of material required and the relative positions of the different areas while still in the flat.

In many shops, arbitrary rules are in force for making allowances for bends. In some, it is customary to allow once the thickness of the metal on each side of the center of the bend and to deduct these figures from the total length when flat. Deductions are made from the outside measurements of the finished material. In others, two-thirds of the thickness of the material is deducted from each side of the center of the bend. All such arbitrary rules are only approximate at best, and their correctness depends on the actual radius of the curve along the neutral line of the material and the thickness of the material itself. This thickness in heavy material partially controls the radius of the curve. Of course the bending instrument, whether block, die, or flanging machine, also influences the radius of the neutral line.

To find the true length of the flat material, the following methods and formula may be used. In Figs. 1 and 2, the lines A and C represent the true lengths of the material up to the beginnings of the bends. The curved lines BB, as measured at the central, neutral portion of the metal represent the true lengths of the curved portion when flat. D is the center of the bend. The length AD on the neutral line will be:

$$AD = A + \left(\frac{6.2832\ R}{8}\right) = A + 0.7854\ R$$

This equals the true flat length of the material to the center of the bend. The formula applies to material of any thickness, bent to any radius, and furnishes an accurate basis for laying out individual shapes or for making patterns or templets.

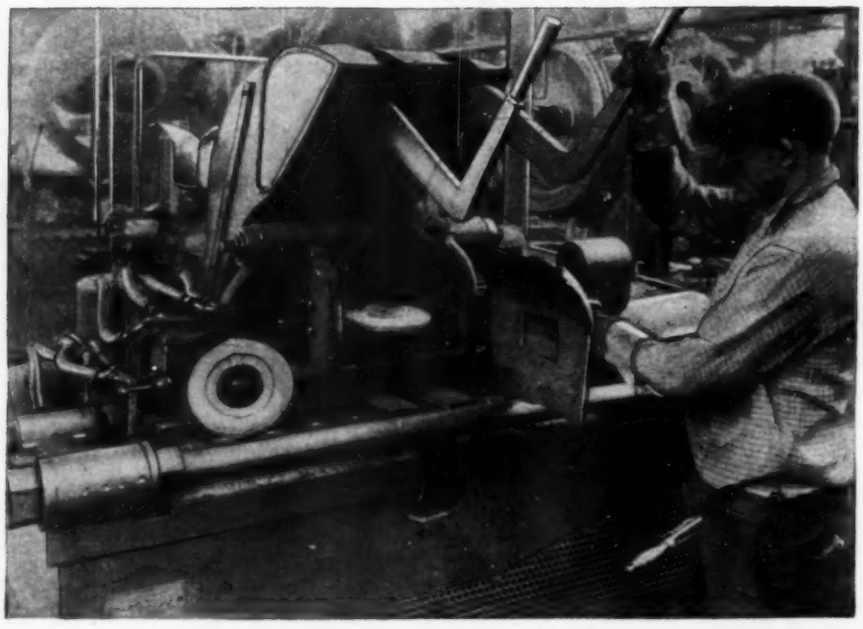
The curved line BB represents the arc of one fourth part of a circle. That portion of the arc on either side of the center D is one eighth part of a circle, therefore its length is obtained by multiplying its radius by 6.2832 and dividing by 8. Of course the formula given above applies only to 90 degree bends. For bends of more or less than 90 degrees, the formula would be:

$$AD = A + \left(6.2832\ R \times \frac{\text{Number of degrees bent}}{2 \times 300}\right)$$

Acute bends are rarely made with heavy material because of the difficulty in working without developing cracks and ruptures. For ordinary purposes, a neutral radius of one or more times the thickness of the metal is desirable, as it reduces the stress on the steel's structure.

Drawings usually show the radius of the outside or inside curve of the required bend. When this is done the neutral radius is easily obtained either by adding one-half the thickness of the metal to the inside radius or by deducting one-half the thickness from the outside curve's radius. Where no specified radius is given, the radius produced by the bending instrument to be used must govern in calculating the neutral radius.

UNUSUAL WELDING JOBS IN FORD FABRICATION



Ring gear blanks, still at a red heat from the prior forming operations, are placed in this Ford welder, where the joint is butt-welded

ONE of the most interesting and unusual series of operations performed in manufacturing Ford chassis, is that involved in fabricating the blank for the differential ring gear, which, instead of being made as a drop-forging, is formed from bar stock rolled in the Ford steel mill to a stepped section which, except for the metal allowed for finish, is of the same section as that of the finished gear. Although somewhat more expensive than a drop-forging, the blank gives substantially the same direction of grain in all teeth, whereas this is not true in a drop-forging.

In forming this blank, the bar stock first is sheared to length with the cuts made at an angle such that, when the bar is formed into a circle the ends come together and are parallel in a radial plane. These lengths are heated to 1,800 deg. F. and then are formed in an upsetting machine in two operations, first into a U-shape and second into a circle. Blanks thus formed next are struck in a die in a coining press, to true them and then are transferred while still at a temperature of about 1,400 deg. F. into a 250-kva. butt-welding machine, which grips the piece at each side of the parting and makes the weld. By having the piece hot, the work done and the current consumed in welding is reduced materially.

After the fin formed in welding is sheared off, the blank is subjected to pressure in a final sizing die in a knuckle press, from which the blank is passed, still at red heat, into a furnace, where it receives heat treatment before machining.

Passenger car axles differ from truck axles both in design and construction. The tubes of passenger car axles first are blanked out from $\frac{1}{8}$-in. sheet stock and then are formed into tapered tubes in heavy presses, after which the longitudinal seam is arc-welded in a continuous machine. As the formed tubes come from the press the joint where the seam weld is to be made is open about $\frac{1}{4}$ in. The tubes are loaded by hand onto a continuous chain or track which forms one unit of the welding machine. As the track nears the point where welding takes place, side members forming a part of the chain are drawn together, pinching the tube and forcing the parallel edges of the seam into contact. Continuing along the track, the tubes contact with the welding-wire electrode in an automatic welding head, which feeds the welding wire automatically. As the joint passes along under the arc, the seam weld is made at a rate of about 42 in. a minute. Tubes are fed into the machine end to end, hence the arc-welding is a substantially continuous operation.

Heretofore all axle tube seams have been welded, and many still are welded, in standard Ford seam-welders in which the tubes are clamped one at a time, after which the arc is struck and the seam is welded as the automatic head is traversed above at a rate of 46 in. per minute. With one of these machines one operator can weld about 500 tubes in 8 hours. After the tubes

The last of two articles on welding as done by Ford.

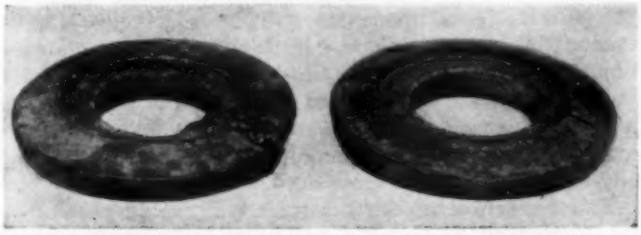
are taken from the machine, the flash is ground off, the tubes are clamped in a sizing die, are gaged, and then are hung upon a chain conveyor which delivers them to a battery of 100-kva. standard Ford resistance welders where machined hub forgings are welded on at the rate of 100 to 120 per hour. The machines used have hand-operated clamps and upsetting levers. Operators are trained to move the upsetting lever back and forth to produce a kind of bumping action after part of the flash has burned off, as this helps to force out gas and to make a better weld than is obtained by constant pressure.

In a similar operation on the same type of machine the forged bell end, which bolts to the differential housing of the rear axle, is welded to the large end of the axle tube at the rate of 120 per hour.

Flash is removed from the welds and the half-axle is tested for run-out, which must not exceed 0.015 in. at the hub. If this run-out is exceeded, the piece is brought within limits by a straightening operation on a press.

The final weld on this section of the axle is the flash-resistance weld which joins the combined spring perch and shock absorber attachment forging to the hub flange. This operation, performed at the rate of 150 per hour, does not affect the hardened and ground ball to which the shock absorber arm connects.

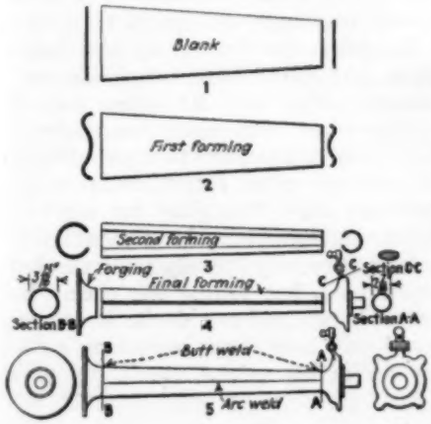
Ample proof of the strength of the axle unit, which weighs only 18½ lb., is shown by the fact that fatigue tests made with the bell end clamped solid and the



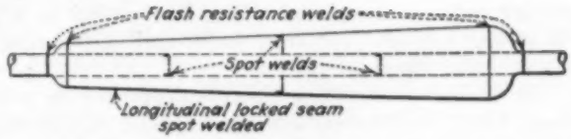
Formed ring gear blank before and after the joint has been resistance-welded

outer end oscillated ¼ in. in an eccentric motion at 250 r.p.m. have shown over 2,500,000 oscillations before failure occurred and the failure then was outside the welds.

Radius rods, forming part of the yoke or so-called



Evolution of the Model A Ford rear axle shaft housing, showing the approximate shape of the tube in blank and successive forming operations. After forming, the tubes are seam-welded, and forgings are butt-welded to each end



Sketch of Ford muffler assembly, showing approximate location and type of welds used in its fabrication

"wishbone," which positions the front axle, are stamped from ⅛-in. stock, folded up, the seam arc-welded, and the end forgings resistance-welded to the tubes in a series of operations much the same as those performed on the rear axle halves. Because of its relatively heavy section as compared to the tube, the yoke forgings that attach to the front axle are cupped where the weld to the tube comes, and are preheated to about 500 deg. F. before the weld is made. As a check on the welds made in this assembly, every completed part is subjected to heavy bending and twisting stresses in a special fixture which quickly shows up any defective welds.

An entirely different class of resistance welding is that done on the gasoline tank which forms a part of the cowl assembly and is made from terne plate drawn in several forming operations. The first welds, made on standard spot-welders, are those used to fasten the internal baffle plates to the shell. Each spot then has to be tinned to prevent later corrosion in service. Next, the two halves of the tank are clamped together and the flanges are spot-welded at points about six inches apart to hold the parts in correct relative position in the succeeding seam welding operation performed on special 150-kva. seam welders having standard Ford heads. Welded seams are formed as the flanges are fed between pairs of six-inch copper wheels having copper-tungsten rims. The 85-ampere current used in operating these machines is interrupted many times for each inch the work travels, an expedient used to prevent burning. After welding, each tank is submerged in water and tested under 30 lb. air pressure to make sure that no leaks are present.

ANOTHER unusual example of welded fabrication on comparatively light-gage, sheet steel is the Ford muffler which is built up entirely by resistance-flash and spot welding, as illustrated in an accompanying sketch. The inner tube of the muffler is formed from flat stock, is punched, rolled up, the edges joined with a lock-seam joint, and two flanged baffles are inserted and spot-welded in place. End-caps for the outer shell are pierced and formed in suitable presses and the shell itself is rolled up from flat stock, the edges lock-seamed, and the seam made secure by spot welds spaced about two inches apart.

Inlet and tail pipes, made from thin-walled tubing bent to shape, as well as the parts already mentioned, are delivered to the muffler welding department where the final assembling is done on standard flash-resistance welders. After the outer shell baffle is spot-welded in place, first one end cap and then the other is welded to the outer shell, the inner tube is inserted, and then the inlet and tail pipes are welded to the small ends of the caps. The welding machines are placed in rows almost end to end, and, as quickly as one weld is made, the assembly is passed to the next machine where

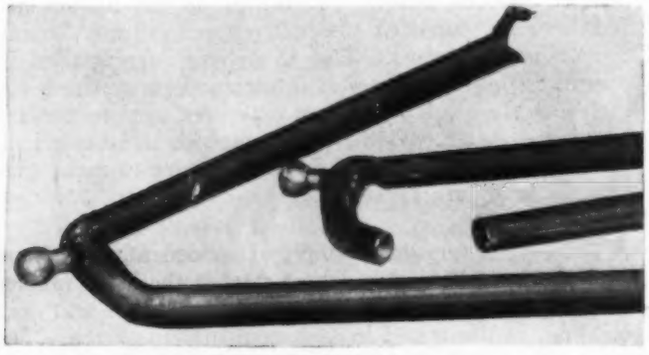
another weld is completed. The final result is a light but strong muffler, free from leaks and with joints that cannot come loose or rattle.

One of the most difficult accomplishments in welding in all Ford developments along this line is that on the stainless-steel headlight rim. Although apparently simple, it was found to be almost impossible to make this weld without a high percentage of imperfect welds. The material used is only 0.026 in. thick and is received in strips 1½ in. wide ready to be rolled into a circle of 9-in. diameter with the ends butt-welded together. After welding, the flash must be trimmed off, the weld flattened in a die, the piece subjected to three forming operations to turn the beads and give a convex contour. Also one edge must be spun over and finally the piece must be ground and polished and buffed. The welded joint then must be invisible.

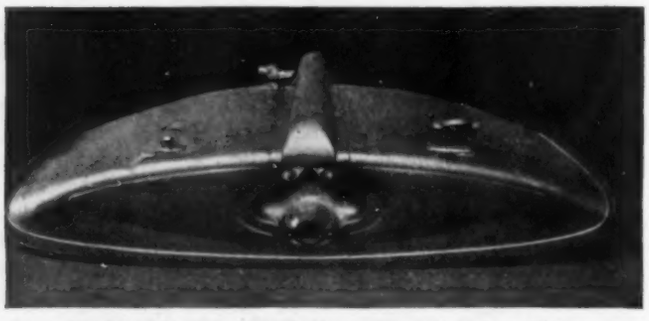
On ordinary steel this welding would prove less difficult, but stainless stock gave much trouble. One difficulty was traced to the stock being thinner at the edges than in the center. Welding dies then made an uneven contact and heating was not uniform. Defective welds resulted. When this fault with the stock was corrected it was found that perhaps a hundred perfect welds could be made successively and then many imperfect ones would result.

A final solution was found when, contrary to all precedent, the faces of the dies that grip the work at each side of the weld, were made from steel, hardened and ground. This insured a positive, uniform contact with the strip and gave almost 100 per cent perfect welds. Defective pieces now seldom exceed a dozen in a day's run of 15,000 to 20,000 pieces. The upset on this job is $\frac{3}{32}$ in. Flash is removed in a special shearing device applied to a punch press. The shearing cutters oscillate, turning about separate centers on opposite sides of the work and in opposite directions, the flash being sheared as the cutters move against it from opposite sides.

When welding in this case, as in many others, it was found to be essential to use machines which automatically control the current, time of welding, and pressure applied, in order to eliminate the human element and to avoid unnecessary waste.



"Wishbone" or radius members used to position the front axle are fabricated by butt-welding forgings to each end of the tubes. The latter are formed from sheet stock and have arc-welded seams



Cowl gasoline tank made from terne plate has all its seams welded in special machines built for the purpose

■

Tooling for Typesetters—*Discussion*

WILLIAM BRYCE
Sheffield, England

THE re-equipment of Mergenthaler Linotype Company, as described by R. R. Mead, will repay study by all supervisors and directors (see *American Machinist,* Vol. 72, No. 21). It is a remarkable example of what can be accomplished by expert planning, and machinery suited for special work. The article deserves emphasis.

The work started with the idea of accuracy to insure successful interchangeability. This ideal was accomplished, and much more besides. The results might well gladden the hearts of those who did the brain work, and those who found the money. If ever a bonus was deserved by engineers, it was in this work. New flooring, motors, shops, machinery, and general re-arrangements were all carried out without upsetting the usual output. Over 700 machine tools were replaced, and nearly 600 re-motored. It was a magnificent display of skill and system.

New machinery of the former type would not suffice; it needed to be suitably designed for accurately combining several operations in one. Take a remarkable instance of attainment. The machine chosen was an Ingersoll, five-head, thirteen-spindle, motor-driven miller. This performed five operations simultaneously, dispensed with five old type machines and operators, did the work in one-fifth the time, yet cost $3,000.00 less than the batch of old type machines. In another, the new machinery cost a third of what the old batch would have cost. In every instance, the new machinery meant smaller first cost, fewer machines and operators, quicker and better work. Doubtless the firm is by now beginning to forget cost, on account of increased dividends.

The lesson is obvious; what they did others may do. The marvel is that firms are sufficiently magnanimous to divulge these things for competitors to copy. Hardly a week passes but someone gives secrets away in this journal. Firms who are now struggling for existence and lamenting competition have here an antidote. Instead of dragging along, they may literally romp through, not only holding their own, but setting the pace. But old crocks, and second hands will not do it; it requires the best available, and may even mean something a little out of the ordinary. Whether or not, result, not price, must be the aim.

The Machinery Industry Makes Its Living By Starving Itself to Death

E. F. Du Brul
General Manager,
National Machine Tool Builders' Association

THERE is one curious economic phase about the industrial machinery industry that has not been touched upon to any great extent. If some good economist has pointed it out, his words have not reached the writer of this article.

It would be an Irish bull with the usual grain of truth in it to say that the machinery industry must make its living by starving itself to death. For instance, suppose a machine concern produces a machine that will make a thousand units of product per hour. Suppose the producer is a good merchandiser and very quickly saturates the market for that machine. A plant has been built to provide quickly all the machines required to saturate its market, say in five years.

Then what can it do? The concern has no more market except the wear-out and replacement demand plus the small demand that comes from growth of population. So Mother Necessity gets busy and brings forth a new design. Let us say that the newly designed machine has double the capacity of the old one and will produce two thousand units an hour.

We still assume that the producer continues a very efficient merchandiser and saturates his new market in three years. With the new design of a capacity of two thousand units an hour, the producer finds it has less than half of the market, in numbers, than was the case with the first design. There will be many places in which the old machine's capacity of a thousand units an hour is ample, and where not more than one machine is needed. Therefore the total market for the new design would necessarily be less than one-half of the market for the design that produced a thousand units an hour. It might well be only 40 per cent. During these three years the producer's shop may not be half as busy as it was in the preceding five years.

Assume that Mother Necessity brings forth another invention, a design that has a capacity of four thousand units an hour, doubling up on the second design. The producer then gets another saturation point that comes on just that more quickly. He cannot sell half as many of these 4,000 unit machines as he did of the 2,000 unit machines. Thus the machinery builder has had to keep himself alive by shutting down his market. This is a curious paradox in the machinery industries as compared to all others. All other industries can grow by increasing their market, but the machinery industry must live by reducing its potential market. By increasing the productivity of designs and improving processes, machinery builders naturally starve themselves to death for the benefit of the rest of humanity.

Certainly their contribution to the welfare of society has been quite definite and quite large, and their returns rather small in proportion. This is true of the builders of all classes of machinery. The world does not appreciate how much it owes to the machinery industry for the comforts and luxuries that the machines produce. The machinery industry has not collected from the rest of the world any large proportion of its contribution to social welfare.

This is one of the problems that one must face if he is in the machinery business. The answer seems to be to collect a reward in proportion to the earnings that the machines produce, so that the builders of the machines will be able to retire with a competence in a very short time. But very few builders of machines realize this fact, and the consequence is that their earnings have been, generally speaking, low.

NEW BOOKS

DIE CASTING PRACTICE—*By Marc Stern, M.E., manager, die-cast division, A. C. Spark Plug Company. 270 pages, 5¼x8 in. Cloth board covers. Published by the McGraw-Hill Book Company, Inc., 370 Seventh Ave., New York, N. Y. Price $2.50.*

Many books dealing with the mechanical arts are so much a collection of catalog and routine photographs followed or surrounded by a description of the pictures, that it is a decided relief occasionally to run across a book that is filled with constructive matter from cover to cover. It is true that much of the matter may have been covered by other books, but the difference is that instead of being merely historical filler, it is treated from a manufacturing standpoint and used as a basis of comparison to point out past mistakes or new possibilities.

The writer had the pleasure of reading the original manuscript of this book and hence read it in a more critical spirit than he would have done, had he been merely reviewing it. The book—not should be—but is, of interest to the mould maker because it points out the faults and possibilities of mould making. It is of interest to the executive because it is an analysis of good practice, and to the engineer because it deals also with the metallurgy and the technical aspects of dies and die-casting.

AUTOMOBILE STEELS—*By Dr. Albert Müller-Hauff and Dr. Karl Stein. Translated from the German by Hans Goldschmidt. 219 pages, 6x9 in. Indexed. Published by John Wiley & Sons, Inc., New York, N. Y. Price $3.50.*

As a concise but very thorough treatise on the steels used in American and European automobile practice this book is outstanding. The first four chapters, consisting of about one-fourth of the book, are of a general introductory nature, taking up the subjects of explanations of physical properties, testing, metallography, and the melting and working of steels. While this material is found in any textbook on materials or physical testing, it constitutes a good summary.

The various classes of steel employed in the modern automobile are taken up in detail, giving the parts for which they are used, the composition, and the treatment. Numerous tables are employed of the properties and compositions, and graphs are given to show comparative variations in properties under given conditions. A number of analyses are tabulated showing the composition and properties of steels employed in various makes of automobiles.

The Foreman's Round Table

THE WORM TURNS

"HELLO, Ed," hailed Al as he called for Ed in his office and found him writing. "Why the willful destruction of company property?"

"Why the airy persiflage?"

"Oh, I merely referred to the apparent waste of paper, pencil, and mental effort. What are you doing, making out a list of rate increases to divide up the pay of the men you laid off?"

"No, I'm writing an article entitled, 'How far should work interfere with the contentment of the worker?' I'm making up a list of all the things management does to make a man contented, and what it expects of a foreman along the same line. That accounts for all the paper you see lying around."

"Without awaiting the publication of your article, Ed, what conclusion do you reach?"

"Well, you know when they started the silver fox industry around here they found that the foxes would not breed. Some foxy guy figured it out that they were too contented. So he tried starving them in the winter, and found that the more you starve them—within reason—the better they breed. That's the reason why poor people have the largest families, I guess."

"I've heard about that. But what has it to do with your article?"

"That was the answer. Why should a contented man work, anyway? There are about twenty things that management thinks it should do to make him contented, from giving him a voice in management to handing him a bonus for having ambition enough to desire one; and about the same number of things for the foreman to do, from giving him time enough to tinker with his flivver, to not interrupting him while he is listening to his favorite college football match over the radio."

"If I get your drift correctly, you want to starve the worker in winter so that he will have a large family and therefore have to work so hard he will have no time for welfare things. Well, it looks as though you might be able to try out that experiment on a small scale this winter, old chap."

"Quit your kidding. It's too serious. Here we are laying off our good mechanics and keeping on welfare men that are only a doubtful benefit anyway. Why not spend the welfare budget keeping men at work? Do you wonder that some one wrote on the wash-room wall 'Millions for welfare, not one cent for raises'?"

"Why do you say 'doubtful'? Been having an argument with the personnel director?"

"No, but it's all so useless. The welfare idea is overplayed. Really big firms do not patronize their workers: only the newly rich ones, like us. It disturbs my men and irritates me, and even gets your goat once in a while. Why don't management hunt for the pin instead of giving the baby a narcotic? The machine operator is the most bossed man in industry and consequently needs more coddling. Put him up against the things that some men stand, and he wilts."

"Why don't you make it a book, while you are at it? I am amazed at your perspicacity."

"It isn't per-anything, it's disgust. The men at our old plant at Colbyville are better men and better citizens, as a whole, even with their dirty plant and obsolete machinery—and why?"

"I'll bite. Why?"

"Because they work hard and are not interfered with. Maternal solicitude about a dirty neck and ears is a beautiful spectacle, but it is extremely irritating to a growing boy who merely wishes to be left alone."

"Maybe that's so, Ed. But I think management would balk at going back to dirty factories and obsolete machinery to make their men happy. There's a limit."

"They don't have to do any such thing. All they have to do is give a man a clean place to work in, a good machine tool, and not interfere with him. Let him think that he is doing some of the directing. We talk about giving a man a voice in management and then deny him the privilege of deciding where he shall hang his hat. We bind him hand and foot with rules and system, and let him see us do it. We rob him of all initiative and incentive and wonder why he is not more enthusiastic about his work."

"You assume, then, that men prefer a dirty shop. Is that it?"

"Well, dirt is at least a sign of non-interference."

Is management overplaying its hand on welfare work? Could the money spent for this purpose be used to better advantage? Are the benefits of welfare work offset by the interruption to work and by the irritation it engenders?

▸ ▸ ▸ Discussion of Former Topics

Doleful Times

The problem of the Colbyville plant is one for which the correct solution generally is secured long after the wrong thing has been done.

Several times, when ordered by the management to reduce the personnel in departments, I have put the issue right up to the workers by having each foreman call his group together, lay the facts before them, and offer anyone who could get work elsewhere a job with us again as soon as we could place him. We also offered them one week off in three or four, so all could have some earnings during a depression. In this way we kept the best men without inflicting too much hardship on anybody. When men are given the facts and feel that the management is both human and humane, they are a wonderful help in such times of trial.

Some employers have tried profit sharing of one kind or another. Others have instituted unemployment insurance of some form. These have been feelers in the right general direction.

I realize that the average workman lives up to the gummed flap of his pay envelope, but Colbyville was different. A policy that approached socialistic or communistic lines would have been an admirable solution for the folks of Colbyville, bearing in mind local conditions and people.

The company and the employees could have had an arrangement so that during prosperous times a certain portion of the profits, after setting aside in surplus a predetermined amount, would be paid as a "good times" bonus. In doing this, the company through its foremen should influence the employees to invest this extra pay in some liquid income-earning investment. During a period of depression, the employees should voluntarily take a wage reduction so that the company could continue to compete on a price basis and not feel the full force of the depression. The "good times" bonus would be the reservoir on which the worker would draw during this low pay period. Depreciation and certain other fixed charges could also be written from surplus during the depression, then what was left of operating costs could be balanced against income from sales, and business carried on at about 60 to 70 per cent of normal.

This violates the book rule of economics as it gives labor a share in profits and also makes it share in losses through a reduced wage; but it breaks down the stone wall between capital and labor.

—E. E. GAGNON, *Mechanical Superintendent, Raybestos-Manhattan, Inc.*

The Community Fund

It is a curious fact that even men who feel the community fund is justified and necessary, hate to dig down into their pockets and contribute when the time arrives. They will do almost anything for a sick friend or a poor relative, but somehow or other a community fund isn't near enough to their hearts to get enthusiastic about. Besides, to the former a man gives voluntarily while to the latter he is more or less forced to give, which doesn't mean that if it was left to the men to give voluntarily, any great success would be achieved. Some would fail to give and most would give very little, because the ones who benefit through their gifts are not close to them.

In my opinion, the head of the department is the logical person to make collections, because, from personal contact with the men, he more than anyone else, is in a position to know more about them, the circumstances they are in, and what they can afford to give. Knowing this, the man will not refuse to give unless he has a good and sufficient reason that will "hold water." Most men will grumble in a good natured way when called upon to contribute, but will, after explanations have been given, furnish the amount they think is right and which, in general, is satisfactory to the foreman making the collection.

—FRANK WALGENBACK, *Foreman, Buffalo Forge Company.*

No Parking

It is an asset to both the company and the owner of a car to have outdoor parking space provided. There are some who would even be willing to pay a small fee to have shelter from the weather and sun, rather than have a good car standing outside.

Many companies furnish lunch rooms, tennis courts, bowling greens, etc., which are considered essential to keep employees contented.

Companies find it advisable to furnish space for these necessities and luxuries. Parking is also a necessity for the man who lives at a distance from his work. Many companies have provided land for expansion when business warrants it, and this land is usually inclosed with a high wire fence. Why not open the gates to employees and build up a nice parking space for cars?

—H. A. GILLILAND, *Hamilton, Canada.*

Keep Out

It sure is pretty tough when the V.P. of a company can't make a change that is for the company's good without incurring the wrath of the man in direct charge. The fact that a man is on vacation does not necessarily mean that all work which will benefit the firm, must cease in his department, nor would a man worthy of the title lose any sleep over the fact that such a thing had happened. There is absolutely no need of losing one's head over such an event, even though the change is not as good as the original method. A sensible man-to-man talk will straighten the matter out much sooner and with no ill feeling.

I had an experience in this line myself: At one time I was employed by a concern whose superintendent was known as the next thing to the impossible to get along with, and while I was away on my vacation he made a change in the procedure that I had laid out. On my return the first thing the man that was affected did was to tell me a long tale of woe, and suggest that I go to my

superior and have it out with him. I could not see it in this light, as the superintendent certainly did not know my reason for making the layout that I had made and consequently could not be blamed for trying to better it. I asked him to come out into the shop while I pointed out the reasons for my method, and when he saw that they were the least expensive, there was nothing left for him to do except agree with me. My advice on a problem of this sort is to make sure first that your way is right; if it was, even a V.P. is not going to throw away the company's money to satisfy himself. If he does, what of it, you have done your best.

—CHARLES R. WHITEHOUSE, *Standards Engineer, Holtzer-Cabot Electric Company.*

Do Errors Cancel Each Other?

Two wrongs certainly do not make one right, but I have some sympathy for Joe. I think several were at fault, as well as he, and a careful examination would reveal just where this was.

If the instructions were clear, then Joe must have had something else on his mind, or was working on the wrong end of his curve. The inspector, in my opinion, should equally share the blame, as his sole excuse for having a job is his ability to determine "go or not go." He is the management's check on the work, and if he cannot be depended on he should be replaced. In this case I think the company should stand the loss but should warn both Joe and Smith. It should also investigate the possible cause and correct it. Inspection is, at best, an arduous task. Some men are fitted for it naturally while others are not, and men employed on that work should not be restricted or browbeaten, but be free to exercise their functions without fear of workers or management.

—JOHN S. ISDALE, *Plant Engineer, International Silver Company.*

Under Cover

There seems to be something in the character or composition of an under-cover man which causes distrust; not even the most biased superior will accept reports from such men as being 100 per cent true. After all, the under-cover man must make some kind of a report to justify his existence, and I have frequently known such reports to be colored to conform with a previously expressed opinion by the man who sent out the under-cover agent. This probably brought about the common practice of having A watch B, and B watch C. While this entails additional expense; it is cheap in the long run and saves many an executive from falling into serious error caused by acting on inaccurate information.

On the other hand, in a large organization there are always crooks, and since they flourish under-cover they must be fought the same way. You can't expect a crook, or a foreman showing favoritism or nepotism, to come out and advertise it, and without making stool pigeons of the whole force, how else can the facts be ascertained than through under-cover work? Far better to hire a dozen under-cover men, if necessary, and place the blame where it belongs, than to hold a whole department under suspicion.

—E. R. SHIELDS, *Processor, Oakland Motor Car Company.*

Vacations Again

I have the pleasure of working for a firm which runs two large works in different towns. We used to have our holidays in batches, to keep the works running all the year. This gave trouble, just as in the case of Ed and Bill Smith, because some two would fix on the same weeks. The difficulty was made worse by the fact that most of the skilled workers were imported, and of course would fix on a week when their friends at home were having their holiday. All this is now past. We close down both factories for ten days. In arranging for the close down, we had to compromise for the reason that the holiday week in both towns varied by two weeks. A vote was taken and a week in between the two town holidays was chosen. We close down from Friday night until Tuesday morning. A full week of this ten days is paid for. This, of course, helps when the men return to work because a full week's pay is waiting for them.

We have what we call a Holiday Saving Club. This is run by the workers themselves. The firm allows the overlookers to act as collectors, and the firm's auditors go through the books. There is no limit to the amount each person can put in each week. Deposits are entered on cards, the moneys are banked each week, and interest is paid on each complete pound. With this help, nearly all our workpeople go away during this ten days.

—T. SMITH, *Nottinghamshire, England.*

Stealing T.C. Tools

The high cost of tungsten-carbide tools is in the mind of all of us, because of their value and their newness. The diamond tools, which frequently cost even more, are not nearly so much thought of at present. Every T.C. tool should be marked with the company's name in a way that cannot be easily obliterated. Where the set-up is simple, it is a good plan to deposit the tool in the crib during any period that it is not in use, if there is any possibility that it might vanish.

High-priced tools and metals have always needed some extra care to keep them under the roof of their owner, and now we have another article added to the list.

—JOHN MARK MAY.

Wrong Number

To what extent should management favor employees in the use of company telephone lines for personal communications? There is a wide variance in general practices—all the way from those incurring a just grievance in some cases against the poor judgment of an operator in denying calls that may be really important, to the example of certain concerns which have an extensive network with ample trunk lines and allow unlimited use of telephones (except for toll calls) by any employee.

The outstanding fact is that company telephones are for company business, not to be interfered with by their use for trivial conversation. The obvious remedy is a well-trained chief operator who may be depended on to use good judgment, to put through the legitimate call, and to protect the lines against the other kind.

—WALTER F. GILCREAS.

1929 MACHINE TOOL PRODUCTION UP 61 PER CENT

Census of Manufactures shows $172 million dollar output

THE Department of Commerce is to be commended on its release of the machine tool figures of the 1929 Census Manufacturers several months in advance of any previous compilation. The preliminary report of the 1927 census for this industry was issued on March 29, 1929. Not only has the time of tabulation been cut by half a year, but the report is far more comprehensive than former ones. For 1927, the machine breakdown showed 38 groups—the present count includes 84 groups.

While the number of establishments remained practically stationary over the two year period, the wage earners increased 46.7 per cent. The still greater rise of 61.7 per cent in wages reflects an improved living standard for men employed in the industry. The receipts for other products and repair work in machine tool plants rose 81.2 per cent topping the remarkable advance in machine tools proper. Because of its prompt release and increased detail, the 1929 census should be of great help to the metal-working industry in planning market and production activities.

According to data collected in the Census taken in 1930, the total value of machine tools made in the United States in 1929 by establishments engaged primarily in the manufacture of such products amounted to $172,349,996, an increase of 60.9 per cent as compared with $107,101,652 reported for 1927, the last preceding census year. Miscellaneous products and receipts for repair work amounting to a total of $67,742,968 were also reported.

This industry embraces establishments engaged primarily in the manufacture of that class of power-driven machines generally covered by the designation "machine tools," but does not include certain types of machines designed for working metal, especially sheet-metal-working machines, welding machines, wiredrawing machines, and wireworking machines.

The statistics for 1929 and 1927 are summarized in the following tables. The figures for 1929 are preliminary and subject to such correction as may be found necessary after further examination of the returns.

Table 1—Summary for the Industry: 1929 and 1927

	1929	1927	Per Cent of Increase or Decrease (—)
No. of establishments	272	276	—1.4
Wage earners (average for the year)*	46,924	31,986	46.7
Wages†	$75,625,004	$46,771,272	61.7
Cost of materials, fuel, and purchased electric current†	$63,652,110	$42,736,673	48.9
Products, total value†	$240,092,964	$144,496,325	66.2
Machine tools	$172,349,996	$107,101,652	60.9
Other products, and receipts for repair work	$67,742,968	$37,394,673	81.2
Value added by manufacture:‡			
Total	$176,440,852	$101,759,652	73.4
Per wage earner	$3,760	$3,181	18.2
Ratio (per cent) of cost of materials, containers, etc., to value of products	26.5	29.6	....

*Not including salaried employees. The average number of wage earners is based on the numbers reported for the several months of the year. This average somewhat exceeds the number that would have been required for the work performed if all had been continuously employed throughout the year, because of the fact that manufacturers report the numbers employed on or about the 15th day of each month, as shown by the pay rolls, usually taking no account of the possibility that some or all of the wage earners may have been on part time or for some other reason may not actually have worked the entire week. Thus in some cases the number reported for a given month exceeds the average for that month.

†Manufacturers' profits can not be calculated from the census figures because no data are collected for certain expense items, such as interest on investment, rent, depreciation, taxes, insurance, and advertising.

‡Value of products less cost of materials, containers for products, fuel, and purchased electric current.

Table 2—Machine Tools—Production, by Class, Number, and Value: 1929 and 1927

Class	1929 No.	1929 Value	1927 No.	1927 Value
Machine tools, total value	....	$172,349,996	.....	$107,101,652
Bending machines	2,497	$1,482,087	439	$368,643
Boring machines:				
Horizontal	159	932,237		
Vertical	257	1,363,881		
Combined boring, drilling, and milling machines, and combined boring and turning mills	222	2,297,245	598	3,352,394
Other	96	983,606		
Broaching machines	259	396,726	255	371,827
Cutting-off machines:				
Band saw	324	194,098		
Cold saw	161	297,908	2,056	602,434
Hack saw	2,680	642,475		
Drilling machines:				
Bench	1,277	183,973	*	*
Horizontal	188	526,205	*	*
Vertical:				
Multiple spindle	913	3,699,275		
Multiple spindle, number not reported	....	649,816	1,078	3,281,236
Standard	2,183	1,588,367	1,771	1,449,295
Sensitive:				
Single spindle	1,825	1,069,486		
Single spindle, number not reported	....	668,234	3,533	1,518,828
Multiple spindle	1,834	2,011,444		
Radial:				
Plain—Universal	1,280	4,579,683	509	1,495,437
Other	....	1,507,493	*	*
Honing machines	....	681,603	*	*

Forging machines:				
Bolt, nut, and rivet	832	2,194,927	663	1,829,707
Bulldozers and other	....	703,819	.....	651,650
Gear-cutting machines:				
Hobbing, generator and other	1,628	6,118,010	1,139	4,047,914
Formed rotary-cutter type:				
Spur	73	283,967	128	368,742
Bevel	56	223,619		
Grinding machines:				
Cutter, drill, knife	2,162	1,573,766	1,723	908,473
External cylindrical:				
Plain	1,358	6,200,946	1,017	2,942,504
Universal	583	1,137,378	408	715,070
Internal cylindrical	920	4,323,439	932	2,893,307
Surface	1,784	3,554,368	786	1,550,857
Emery-wheel	11,999	364,552	*	*
Other	....	6,080,443	.....	3,239,990
Hammers (not portable)	....	1,483,915	.....	560,459
Keyseaters	....	94,999	*	*
Lathes:				
Automatic (single and multiple spindle)—				
Bar	3,339	12,353,441	12,877	23,958,448
Chucking	1,398	6,002,597		
Bench	1,026	337,739		
Engine:				
General utility—				
Capacity 16-in. swing and under	6,265	5,321,765		
Capacity over 16 in. swing including 22 in	1,525	3,177 746		
Capacity over 22-in. swing including 36 in	674	2,356,963		
Heavy duty, over 36-in. swing	41	482,798		
Gap and all other	....	3,123,355		
Polishing, buffing, grinding	1,479	675,857		
Turret:				
Hand screw machines	1,004	2,717,865		
Horizontal, vertical, and other automatic	....	11,909,450		
Milling machines:				
Hand-feed	312	129,803	2,978	8,545,125
Power-feed:				
Plain	1,090	2,690,851		
Universal	2,270	5,840,142		
Vertical	453	1,341,362		
Lincoln type	826	2,546,504		
Planer type and other	605	3,528,481		
Planers:				
Standard—				
36 in. and under	61	359,627	196	1,867,449
Over 36 in.	57	807,835		
Open side	86	839,395		
Special	45	263,251		
Pipe cutting and threading machines	976	1,180,190	2,281	1,344,145
Portable tools:				
Drills—				
Electric	85,521	3,226,470	82,903	3,742,643
Pneumatic	13,712	1,744,503	11,627	1,108,839
Grinders—				
Electric	31,862	1,463,569	34,211	2,732,603
Pneumatic	10,072	1,065,625	*	†
Hammers (chipping, riveting, calking, etc.)				
Electric	3,225	484,075	†	†
Pneumatic	29,224	1,694,961	30,513	3,467,486
Woodworking—				
Electric hnad saws and	....	923,226	†	†
Other, including flexible shaft tools	....	3,721,529	.....	5,750,003
Presses:				
Forming and hydraulic	609	1,756,371	.....	8,770,001
Stamping—				
Foot	273	52,195		
Power	4,343	6,608,334		
Punch	1,634	1,001,324		
Arbor, hand, and other	2,317	23,815		
Punching machines (not portable)	320	1,038,331	638	862,118
Riveting machines — light and heavy duty	779	178,426	1,368	673,307
Shapers:				
Horizontal—				
20 in. stroke and under	1,026	1,415,539	986	1,608,77
Over 20 in. stroke and including 28 in	431	837,774		
Over 28 in. stroke	191	506,994		
Shears (hand)	797	22,696	†	†
Shears (power)				
Combination punch and shear	227	347,734	1,771	1,308,169
Rotary	550	193,591		
Straight	746	961,892		
Alligator and other	281	421,900		
Slotters	124	184,921	36	182,154
Threading machines (except for pipe)				
Die type	636	1,255,286	538	546,209
Milling type	150	680,432	113	482,177
Tapping machines	402	544,380	484	584,730
Other machine tools and machine tools not distributed by kind	....	11,689,760	.....	7,398,504

*No comparable data.

†Not called for separately; included in: "Other machine tools."

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How Much Junk Is Under Your Benches?

Discussion

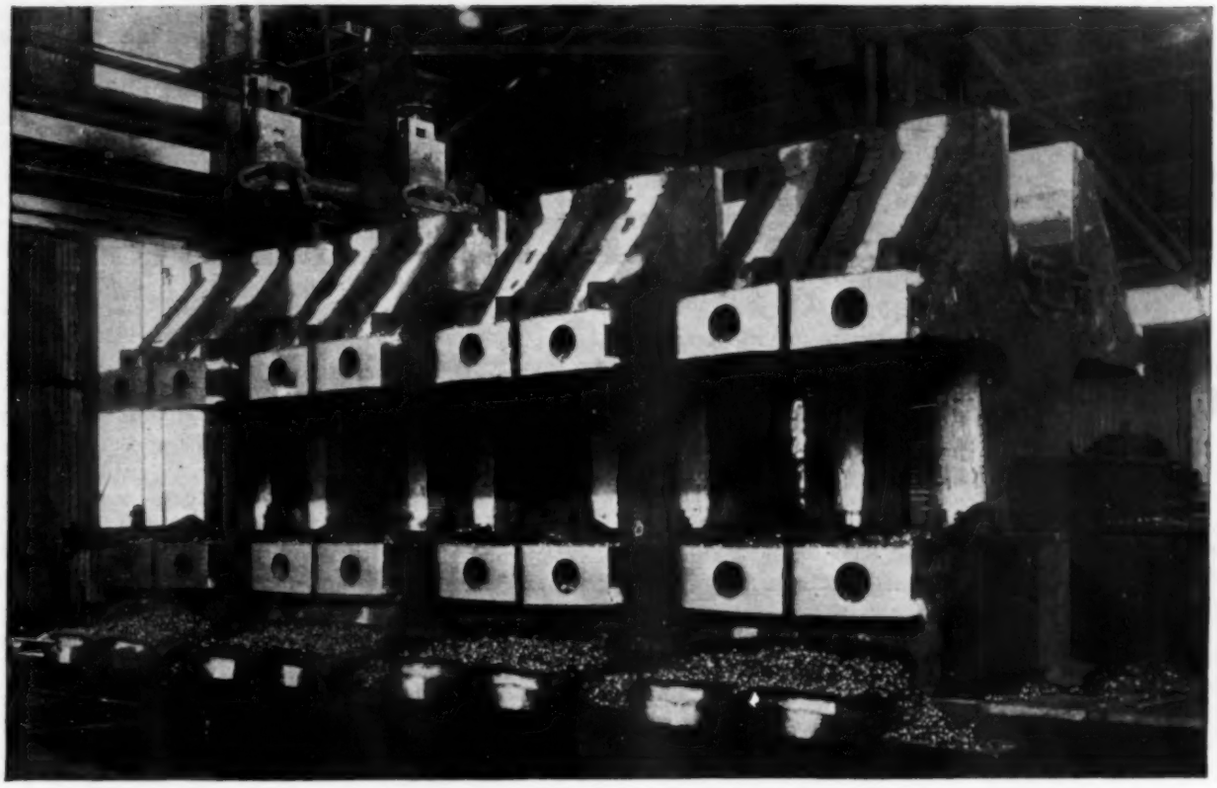
J. T. Towlson
London, England

MY REPLY to the query of Henry C. Francis, in his article under the title given above, on page 665, Vol. 72, of the *American Machinist*, is "None." As a shop foreman for nearly half a century, I am in full agreement with the tone of the argument advanced.

It, however, appears to be quite relevant to issue a word of warning to the new management of any particular set of shops, especially to those who, on commencing their professional duties, clear out, not only scraps from under the benches, but all and sundry found there; meaning that it is quite improbable for a new man to discriminate sufficiently ere he scraps quite rough-looking articles, valuable to a particular shop but of only scrap value to other people. I have known cases where a new manager has stepped over the head of the shop foreman and scrapped this and that, after but a casual inquiry as to their aforetime and prospective use and comparative value. It has been only when conditions arise where the scrapped device is again in demand, that the scrapper discovers that he has been a little too hasty and indiscriminate.

A martinet for cleanliness, I have a motto that "Nothing should be kept in the workshop but tools in use and work in progress." All small tools, such as drills, reamers, and cutters of all kinds, should, of course, be kept in the tool stores, and under strict control. All jigs should, after having been given a stamped number, be kept in auxiliary stores, and their numbers and applications recorded most clearly on a sheet or in a book. All comparatively rougher devices, while they may be quite rough but equally valuable, should be kept in a store, and a record of their purposes should be kept in full detail, accompanied by sketches, if necessary.

If the class of work a particular concern is engaged in requires that such stores as various kinds of spanners, ratchet braces, light lifting-tackle, etc., be kept quite handy for immediate use, let such be hung on white-washed walls or from the beams, not under benches.



Planer set-up of 8 steel sugar mill housings

SUGAR MILL MACHINERY IN HONOLULU

CHARLES F. HENRY

YEARS AGO I ran across a small shop in New Orleans which built coining presses for the Chinese mint in Pekin despite the competition from larger and better known plants in large industrial centers. So it was not surprising to find that heavy sugar mill machinery is built in Honolulu, 2,100 miles from our West coast, for shipment not only to the Philippines but to Cuba as well. The Honolulu Iron Works has a large plant in the Hawaiian islands in addition to the plant in Manila. The latter, however, is largely for sugar mill repairs and for marine repair work.

At Honolulu the sugar mill work is of a somewhat different character than in Cuba, where, owing to the coming of the rainy season, it is necessary to grind as rapidly as possible after the sugar cane is ready to cut. There high-speed crushing is essential and breakdowns may mean irretrievable loss. In Hawaii, however, the fear of rain is not a factor, and they can grind the cane with more leisure. Owing to their distance from centers of consumption and the fact that cane is more expensive to raise because of the need of heavy fertilization, it is necessary to get the greatest percentage of juice extraction, and the slower rate of crushing is an advantage. Then, too, there is the distribution of the work over a longer period, which avoids much of the feverish haste for repairs found in the Cuban sugar districts.

Machining methods are much the same as in other repair shops for similar work. Heavy machine tools, not necessarily of the latest design, are an essential part of the equipment. Planers, both open side and with double housings, are as necessary as lathes and boring mills, of both vertical and horizontal types, or radial drilling machines. And while these are largely for repair work, the building of new machinery is easily taken care of as indicated by the job illustrated. This shows eight cast-steel cheeks, or housings, for sugar mills, being machined at one setting on the large Niles planer, using all four tool heads. These housings were for the Pampanga Sugar Development Company in the Philippines, about 3,500 miles away. The set-up indicates that when opportunity presents, the economy of multiple planning is fully appreciated.

FORWARD STEPS IN METAL WORKING

A few high-lights and reflections from the technical sessions of the recent National Metal Congress

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WHEN four engineering societies acting in collusion perpetrate a five-day meeting, each holding its own sessions simultaneously, complete assimilation of the information spilled about can scarcely be anticipated prior to the next world war. Voluminous detailed reports, termed transactions, will reach those interested in due course. For *American Machinist* readers, however, the following "fractions" have been distilled off from text and discussion, without pretense of complete extraction.

Corrosion-resistant metals, including especially the high-chromium ferrous alloys, proved to be the chief topic of discussion, but non-metallic molded plastics were given careful consideration, and metals in which iron is a minor constituent or entirely absent were not forgotten. All forms of welding were the subject of numerous papers. Aluminum alloys, it appeared, are now arc-welded successfully, as are also nearly all ferrous and some copper-base alloys. Grinding and polishing problems are beginning to receive the engineering study they deserve. Nitriding seems to be coming into its own.

Electric motor standardization probably is just around the corner. Better castings of all description, as well as improved tool and die materials, are gaining increased recognition. Forgings of colossal size for use at high-pressure and elevated temperature are being produced for many industrial purposes. Better methods and equipment for heat-treatment are emerging and practically all machining processes are being speeded up and improved in other respects. Yet these do not begin to complete the subjects given consideration.

Discussion of the excellent paper by A. M. Lynn on the plastic molding methods used in the Western Electric Company shops and of L. V. Quigley's paper on Phenol Resinoid Molding Technique brought out many items of importance. The need for consulting the molder before laying down the design of plastic parts was stressed, and it was pointed out that the cost of finishing the part after molding should not be overlooked, as this cost sometimes equals that of the molding operation. Tungsten carbide tools now are used extensively in finishing molded plastic parts. Stamped steel sub-set boxes at present are being replaced by slightly smaller boxes of molded phenolic resin at a cost only a little greater than that of the steel box, at the same time producing a more enduring and otherwise superior box. These boxes, weighing 8 oz. each, will be produced at the rate of 1,000,000 a year on 350-ton Duo-presses using eight-cavity molds.

Arc-welding of aluminum, heretofore regarded as impractical, has been developed to a point of commercial utility in the laboratories of the Aluminum Company of America, according to W. M. Dunlap of that organization. The rod used should have the same composition as the material welded and a coating of flux to envelope the arc, which should be as short as possible. Welding is done on a 60-volt circuit, and 85 to 100 amp. are used for a $\frac{1}{8}$-in. rod. The flux must have a melting point slightly higher than that of the alloy welded. To date, plates varying from No. 14 B & S gage up to $\frac{3}{8}$ in. in thickness have been welded readily. Castings also have been welded, but preheating is required in some cases.

Other speakers before the Welding Society indicated that nearly all kinds of stainless and other high-chromium steels are being welded successfully, but practice at present varies so widely that definite rules for the best procedure cannot be established as yet. In some cases an oxy-acetylene flame is used to better advantage than the arc, but on thin sheets of the 18 per cent chromium —8 per cent nickel alloys, the electric arc has proved more satisfactory because it is faster and causes less buckling, according to L. W. Hostettler of the Allegheny Steel Company.

All present methods used in welding pipes were outlined in Leon Cammen's paper before the A.S.M.E., but a new method being developed for making spirally arc-welded pipe was dealt with in detail, the low cost of the machines required being among the chief advantages named by the author.

That efforts to improve methods and conditions in grinding and polishing departments of metal-working plants are needed and also receiving serious consideration, was made apparent by the paper presented before the A.S.M.E. Machine Shop Practice Division by Robert T. Kent, Director of Engineering, Divine Brothers Company, and the discussion which followed. So many variables, few of which are well understood by polishers, enter into polishing work that almost no standard practices are followed. The need for basic research on these problems was voiced in the discussion and the willingness to co-operate in their solution was expressed by the author.

It was pointed out that the photo-electric cell can be adapted to measure the degree of perfection in polishing. Other speakers expressed the view that no metal should be removed in polishing, and that high luster is best produced by using oil or grease on the wheel. One speaker on the subject of polishing high-chromium steels said

that difficulties often arise from pitted metal and that the makers of such steel should support and prosecute research calculated to overcome the difficulties encountered in polishing such material.

Means for easier changing of wheels are needed and the search for an adhesive not soluble in water and still suitable for binding abrasive to the wheel should be prosecuted. In a ten-wheel polishing room a saving of $8,000 to $10,000 a year sometimes can be made by merely improving the practice employed in selecting and using glue. "This," said Mr. Kent, "is an example of the economies possible through improved methods in grinding and polishing departments. Fortunately," he added, "engineers are beginning to study grinding room practices, hence conditions are beginning to improve."

Rapid advances in nitriding are being made in many of the plants where furnaces for this class of heat-treating are used. A half-dozen papers dealing with various phases of this process, the results achieved and the equipment used made this fact apparent. According to J. H. Higgins, materials engineer, Camden Forge Company, whereas a year ago the average nitriding furnace charge was perhaps 300 lb., today it is frequently 10,000 to 15,000 lb. and single forgings weighing as much as 3,000 lb. each are nitrided successfully. There still is, however, a marked difference of opinion concerning the optimum temperature for nitriding and the form of furnace to be used. Furnaces for continuous nitriding are now being developed by at least one manufacturer.

FOR reasons yet to be explained, erratic results sometimes occur as a result of the nitride treatment, with no apparent change in conditions. Warpage frequently results from nitriding, especially when the strains occasioned by forging and earlier heat-treatment have not been removed, but by proper normalizing prior to nitriding it is not difficult to avoid warpage thereafter. A reduction in the time required for nitriding can be effected by packing the work in various finely divided materials, as has been demonstrated in tests made by engineers of the Union Carbide and Carbon Research Laboratories.

A lively and prolonged discussion followed the papers presented by Herbert Chase of *Product Engineering* and *American Machinist,* and J. L. Brown of the Westinghouse Electric & Manufacturing Company dealing respectively with flange-mounted motors and with the design of motors with standard interchangeable parts. There was general agreement concerning the need for standardization of all types of motors, especially as regards mounting dimensions, but some speakers disagreed with certain of the advantages attributed to flange-mounted motors although the majority appeared to view this type with favor.

It was stated by two speakers that the National Electric Manufacturers' Association has agreed upon a set of standard mounting dimensions for foot-mounted squirrel-cage induction-type motors and is working upon proposed standard dimensions for other types, concerning which later announcements will be made.

Although the engineer of one large purchaser of motors indicated that his company was much in favor of flange-mounting and purchased this type whenever feasible, another discussor told of a large user who had refused to buy machines with this type partly because spares are less readily obtainable for service in the event of breakdowns. At present this and the lack of standardized flanged types appear to be the chief items standing in the way of wider use of flanged motors.

In their paper on corrosion and heat-resistant cast iron, J. S. Varick and P. D. Merica of the International Nickel Company indicate that this alloy, containing about 3 per cent carbon, 1.7 per cent silicon, 1.2 per cent manganese, 12 to 15 per cent nickel, 6 per cent copper, 1.5 to 4 per cent chromium, and now in extensive use for over three years, can be produced readily in any well-organized foundry. It has found wide application already in several industries needing relatively inexpensive castings capable of better heat and corrosion resistance than ordinary grey iron, and its high coefficient of thermal expansion, freedom from grain growth, nonmagnetic qualities, and high electrical resistivity have found for it numerous special uses of considerable importance. It is not greatly different in machining qualities from ordinary cast iron if the chromium content is kept below 3 per cent.

According to A. S. Jameson of the International Harvester Company, carbon-steel has proved more suitable for cold-heading dies than alloy steels, partly because it is easier to control the depth of case and thereby to secure maximum life of the die. The steel that proved best in the tests he made had the following percentage composition: carbon 1.0, manganese 0.45, sulphur 0.012, phosphorus 0.024, silicon 0.22, and chromium 0.12.

"Any grinding introduces stresses on the surface ground," said G. B. Brophy, "and if these stresses are superimposed upon quenching stresses, a cracked surface sometimes results. Nitric acid pickling does not produce cracking, but weak solutions of hydrochloric or sulphuric acids do so in some cases."

Prequenching treatment of tool steel was recommended as a result of tests conducted and reported by R. H. Harrington of the General Electric Co., if articles of tool steel are being heat-treated on a large scale requiring as short a time at high temperature as possible.

■

Tolerances and Tools—*Discussion*

R. HOPPE
Rock Island Arsenal

MR. OVAITT'S method has great merit inasmuch as the maximum reamer wear is utilized, thereby reducing tool costs. However, the tolerances prescribed in the article are in direct conflict with recommendations of the American Standards Association, B 4a—1925, "Tolerances, Allowances, and Gages for Metal Fits."

This bulletin prescribes a unilateral plus tolerance for holes and a unilaterial minus allowance for shafts. It surely would be of great benefit to the industries to follow the A.S.A. recommendations, and at the same time, take advantage of Mr. Ovaitt's method by having standard commercial reamers manufactured sufficiently larger than the basic size to produce a hole within the tolerance prescribed in B 4a for the Loose Fit (Class I).

I am preparing standards for tools and equipment used by the Ordinance Department and am greatly interested in standardization. I would be pleased to have *American Machinist* bring this to the attention of the A.S.A., and also to have the comments of other readers on the subject.

AMERICAN MACHINIST 1930 INVENTORY

of Metal-Working Equipment

INCLUDED in this classification are plants making products of aluminum, copper, tin, brass, bronze, and other non-ferrous alloys, clocks, watches, and other time recording devices, and enameled ware. The *American Machinist* 1925 inventory did not report this group. By coincidence the percentage of old equipment in non-ferrous product plants according to the present count coincides with the 44 per cent determined for all industries five years ago. The indication is that this class of manufacture differs little in the physical condition of its equipment from the average of the iron and steel product industries. This inference is further supported by Report No. 5 of the present series (Vol. 73, page 436), covering plants making iron and steel products other than machinery, which showed 47 per cent of equipment over ten years old.

Report No. 9—Machines engaged in the manufacture of metal products other than iron and steel

Although average in machine age, non-ferrous product plants are very different in machine group percentages. For example, again referring to the 1925 inventory, power presses constituted 4.9 per cent of the total machines for all industries while hand presses had a corresponding figure of 3.1 per cent giving a combined percentage of 8.0. The present group has 18.2 per cent of power presses and 4.2 per cent of hand presses totaling 22.4 per cent.

Machines in Plants Making Non-Ferrous Metal Products

	Total Number in Plants 1930	Number Installed Before 1920
LATHES		
Engine	9,910	4,879
Hand Turret	5,946	3,441
Power Turret	806	283
Automatic and Semi-Automatic	457	109
Chucking (Not Chucking Machines)	327	218
Speed and Bench	5,837	4,138
Toolroom Type	1,112	392
Other	3,027	1,764
CHUCKING MACHINES (Not Chucking Lathes)	87	22
SCREW MACHINES		
Hand	3,115	1,241
Automatic, Single Spindle	1,808	1,133
Automatic, Multiple Spindle	1,329	610
CENTERING MACHINES	65	22
MILLING MACHINES		
Hand (No Power Feed)	1,503	457
Bench	1,350	414
Plain (Knee and Column Type)	2,330	1,067
Universal (Knee and Column Type)	2,026	1,176
Vertical (Knee and Column Type)	828	348
Lincoln Type Manufacturing	218	109
Continuous, Rotary Table or Drum Type		
Planer Type	174	65
Other	588	327
GEAR CUTTING MACHINES		
Rotary or Milling Type	741	632
Hobbing	65	44
Planing or Shaping	22	
Other		
BORING MACHINES		
Horizontal Boring, Drilling and Milling	240	131
Vertical Boring Mills	261	131
Other	131	
JIG BORERS		
DRILLING MACHINES		
Radial	871	305
Upright, One Spindle	7,971	3,615
Upright, Two or More Spindles	1,394	762
Upright Gang (Two or More Heads)	240	174
Sensitive, One Spindle	4,182	1,938
Sensitive, Two or More Spindles	784	566
Sensitive Gang (Two or More Heads)	87	
Two, Three and Four Way	44	44
Other	1,307	762
THREADING MACHINES		
Single Spindle Tapping	1,329	566
Multiple Spindle Tapping	283	174
Pipe Threading and Cutting	305	131
Bolt Threading and Cutting	305	131
Thread Chasing	174	65
Thread Hobbing and Milling	109	65
Thread Rolling	44	22
Other	152	65
PLANERS		
Open Side	218	131
Double-Housing	610	348
SHAPERS		
Vertical	152	44
Horizontal	2,657	1,590
Slotters	87	
KEYSEATING MACHINES	196	131
BROACHING MACHINES	240	
GRINDING MACHINES		
Plain Cylindrical	1,067	545
Universal Cylindrical	806	436
Surface, Reciprocating	1,742	741
Surface, Rotating	523	109
Internal	174	22
Crankshaft	283	
Cutter	523	240
Floor, No Feed Attachments	2,810	1,307
Bench, No Feed Attachments	2,134	1,220
Abrasive Disk	937	283
Abrasive Belt	784	152
Centerless	65	
Other	2,723	414
POLISHING AND BUFFING MACHINES (Including those in Plating and other Depts.)	4,683	2,113
Abrasive Wheel, Hand Operated	4,421	2,461
Abrasive Belt, Hand Operated	632	109
Automatic and Semi-Automatic	1,285	283
LAPPING MACHINES	196	44
HONING MACHINES	22	22
CUTTING-OFF MACHINES		
Parting Tool Type	109	22
Power Hack Saw	2,243	762
Rotary Cold Saw	348	87
Bandsaw	1,350	305
Other	218	109
WIRE FORMING MACHINERY		
Spring Coiling	240	87
Other	4,944	3,223
WELDING AND CUTTING MACHINES		
Resistance Welding, Butt	152	65
Resistance Welding, Spot	2,113	348
Resistance Welding, Seam	240	
Resistance Welding, Other		
Arc Welding	893	
Electric Cutting		
Gas Welding	1,089	196
Gas Cutting	392	87
RIVETING MACHINES, STATIONARY		
Pneumatic	109	
Hydraulic	22	
Power	1,024	152
PRESSES		
Punching Machines	4,247	1,416
Combined Punches and Shears	174	109
Hand, Arbor	1,518	675
Hand, Light Punch Press Work	632	370
Foot, Light Punch Press Work	4,356	2,330
Power, Crank Type	17,947	5,641
Power, Toggle Type	1,437	412
Power, Double Acting	707	306
Power, Dieing Type	749	196
Power, Trimming Presses	475	174
Power, Forcing, Arbor, Wheel	218	44
Hydraulic, Bending, Forming, Drawing	306	174
Hydraulic, Wheel Forcing, etc.	65	
Baling, Power and Hydraulic	174	44
Other	1,613	1,416
BENDING AND STRAIGHTENING MACHINES		
Bending Brakes	1,546	566
Bending Rolls, Horizontal	915	283
Bending Rolls, Vertical	22	
Straightening Rolls	392	44
Other	370	174
SHEARS		
Knife	3,659	1,002
Rotary, Slitting	1,459	327
NIBBLING MACHINES	218	22
HAMMERS		
Drop	1,176	741
Helve	109	
Spring	87	22
Steam	196	65
Pneumatic (not portable)	65	22
Other	653	152
FORGING MACHINES		
Bulldozers	65	65
Hot Forging Machines	131	87
Cold Headers, Bolt, Nut, etc.	44	
Cold, Swaging	44	22
Forging and Flanging Presses, Hydraulic		
Other Forging Machines		
Total	155,159	67,597

IDEAS FROM PRACTICAL MEN

■

Overhead-Pilot Taper Attachment for a Turret Lathe

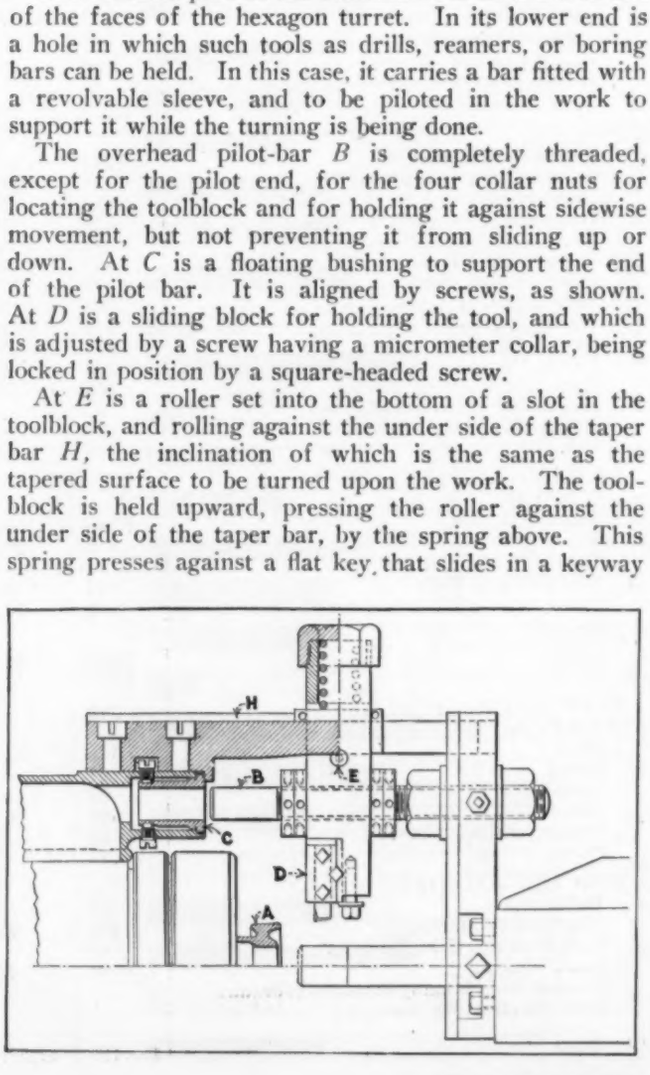
W. N. DELENK
Special Machine and Tool Engineer,
The National Acme Company, Windsor Plant

IN MANY instances, where certain surfaces have to be formed in a turret lathe, finishing cuts by means of forming tools are sufficient. Often, however, it is advisable to do the work with single-pointed tools. An attachment for just such a purpose is shown in the illustration. It was designed for turning the tapered surfaces of commutator shells, as shown at *A*. The illustration shows the set-up for the second operation, the taper surface having been rough formed in a previous operation.

The movable part of the attachment is fastened to one of the faces of the hexagon turret. In its lower end is a hole in which such tools as drills, reamers, or boring bars can be held. In this case, it carries a bar fitted with a revolvable sleeve, and to be piloted in the work to support it while the turning is being done.

The overhead pilot-bar *B* is completely threaded, except for the pilot end, for the four collar nuts for locating the toolblock and for holding it against sidewise movement, but not preventing it from sliding up or down. At *C* is a floating bushing to support the end of the pilot bar. It is aligned by screws, as shown. At *D* is a sliding block for holding the tool, and which is adjusted by a screw having a micrometer collar, being locked in position by a square-headed screw.

At *E* is a roller set into the bottom of a slot in the toolblock, and rolling against the under side of the taper bar *H*, the inclination of which is the same as the tapered surface to be turned upon the work. The toolblock is held upward, pressing the roller against the under side of the taper bar, by the spring above. This spring presses against a flat key that slides in a keyway in the upper side of the taper bar, the key being held in the toolblock by two pins.



Since the taper bar must be rigidly held, one end is attached to the headstock by screws, the other end being piloted in the upper part of the attachment carried by the turret. When this end of the taper bar is out of engagement with the hole, the turret can be rotated without interference. This attachment is a very useful standard addition to any turret lathe, the only special detail being the taper bar, which can be made to suit almost any requirement, even for turning irregular shapes, and spherical or crowned surfaces.

■

Adjustable Dies for Making Bands

CARL E. SCHINMAN
Production Engineer, Aero Production Company

Press tools for making bands of the type shown enlarged at *A*, Fig. 1, but of different sizes, are shown in the illustrations. The strip of brass ribbon is stamped, as at *B*, and is then cut to length by the tools shown in cross-section in Fig. 1. The stock stop *C* is adjustable, so that strips can be cut for bands of various sizes. At *D* is the stamp, while at *E* is the shearing punch. The stop has a V-groove in its end to hold the stock to be cut off in a straight line, permitting accuracy in the length of the blank. Attached to the shearing block is the stripper *H*, under which the stock passes in a groove, and which is slotted to admit the lettering punch. The stock can be fed either by hand or by an automatic feeding attachment. In either case, the operation is practically continuous, the production being about 6,000 pieces per hour.

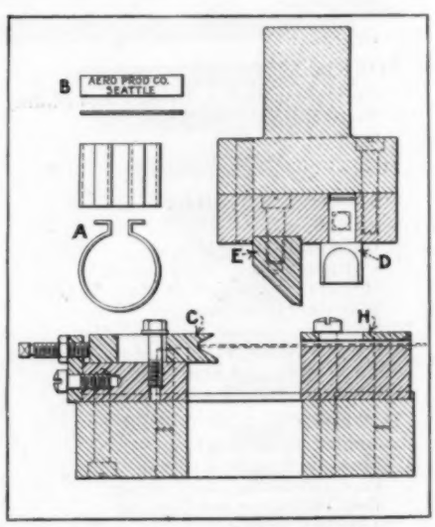


Fig. 1—The finished band and the tools for stamping and shearing the blank

In Fig. 2 is shown the construction of the forming tools. The lower member has two sliding blocks carrying hardened pieces for forming the ears at the ends of the bands. On the tops of the sliding blocks are adjustable gage blocks for centering blanks of various lengths. The sliding blocks are kept apart by springs. Between them is a V-block, forced upward by springs, and limited in its downward motion by adjustable stops. The upper member carries the forming punch and the wedges for operating the sliding blocks in the lower member, the

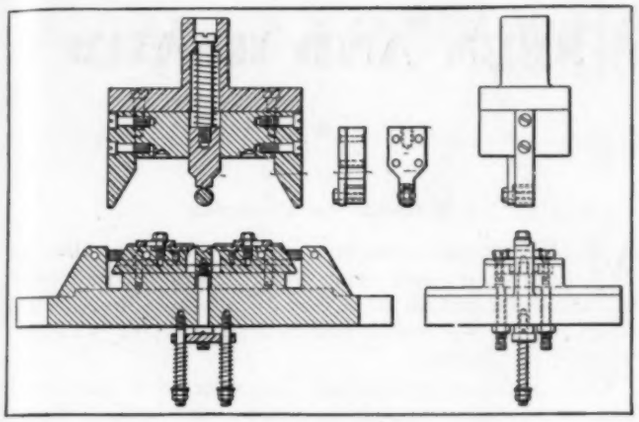


Fig. 2—The tools for forming the band

outer surfaces of the wedges being backed up by lugs on the die-shoe. The shank of the forming punch is rectangular in section, fitting in a hole of the same shape, and is backed by a helical spring. The punch itself is a short mandrel, secured to a plate riveted to the shank.

In operation, the blank is placed between the gage blocks, its middle resting upon the V-block. As the ram descends, the blank is forced against the V-block and then downward, carrying the V-block with it, until the downward movement of the V-block is arrested by the adjustable stops below. As the blank is carried past the forming pieces on the sliding blocks, it is bent into a U-shape. When the downward movement of the V-block is arrested, the forming punch also comes to a standstill. Continued downward movement of the ram permits the punch holder to slide down over the punch, compressing the spring behind it and bringing the wedges into contact with the beveled edges of the sliding blocks.

As the sliding blocks move inwardly, the hardened pieces on their tops force the legs of the U around the forming mandrel, producing the necks and the ears, as shown on the band at *A*, Fig. 1. As the ram ascends, the punch and the V-block remain at rest until the wedges have released the sliding blocks and allowed them to return to their starting positions. The forming punch now starts to ascend, allowing the V-block to assume its top position. Continued upward movement of the ram brings the punch away from the V-block, leaving the completed band on the mandrel, on which it hangs loosely, owing to the natural spring of the metal. Since the press is operated in an inclined position, the band slides off of the forming mandrel as the ram nears the top of its stroke.

■

Removing Oil Stains From Finished Surfaces

U. S. Avery
Superintendent, The Sterling Manufacturing Company

After several years of use, nearly all machines will have their finished surfaces badly stained from the oil used in lubrication. If used machines are kept in storage for any length of time, the stains are likely to be worse than if they had been kept in use.

The most satisfactory method we have found for removing the stains is as follows: Saturate a small piece of cloth or waste with paint remover and apply to the stained surfaces. Allow the paint remover to remain on the surfaces for about fifteen minutes, then wash it off thoroughly with gasoline. Care must be taken not to get any of the paint remover on the painted surfaces, or it will remove the paint.

If the part to be cleaned is removable, has no painted surfaces, and is small enough to be put in a pan and be covered with the paint remover to cover it, it is necessary only to handle it in this manner. A cover of some kind should be put over the pan to prevent undue evaporation. After soaking for about fifteen minutes, wash off the part thoroughly with gasoline. The washing operation is a very important one, as the finished surfaces will rust very quickly if the paint remover is allowed to stay on them.

We have taken such articles as drill chucks that have not been in use for years, and after putting them through this process it was almost impossible to tell them from new. On hand-scraped surfaces, such as the ways of engine lathes, this method of cleaning will restore the scraping effect to its original condition, regardless of the age of the machine, provided, of course, the scraping has not been badly scratched or worn from use or abuse.

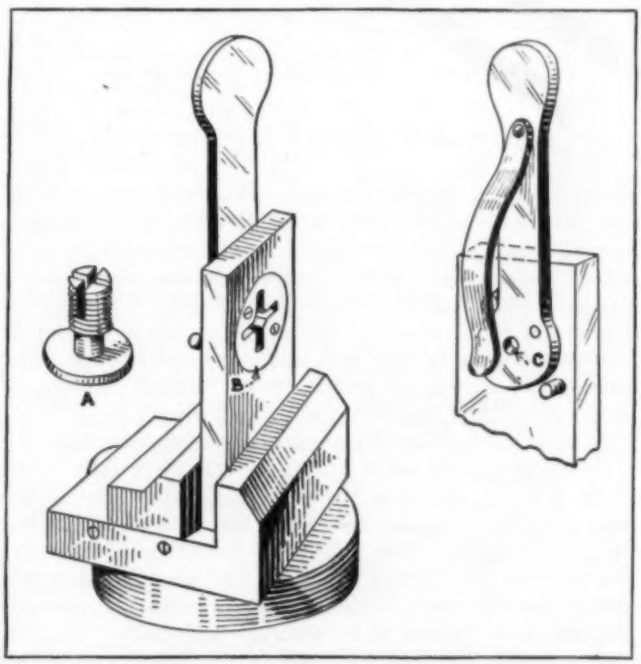
Any concern engaged in rebuilding or dealing in second-hand machinery will find this method of removing oil stains a great help in restoring its original appearance.

■

A Simple Slotting Fixture

Charles H. Willey
Assistant Plant Superintendent, Hoyt Electrical Works

We were recently called upon to slot a few thousand parts like the one shown enlarged at *A*, the requirements being that the parts were to have two 0.025-in. slots at right angles to each other. We did the job quite easily in the fixture illustrated, holding the fixture in the vise



Fixture for cutting slots at right angles.

of a rather small hand-operated bench milling machine.

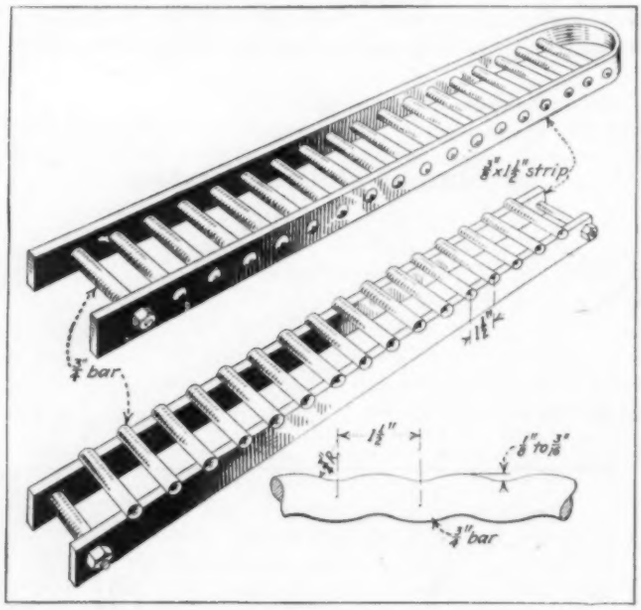
The part *B*, having a hole for the work, is shouldered into the fixture, and is secured to the lever at the back by two screws. Stop pins position the lever for the two cuts. The work is placed in the hole *C* from the rear, and is held by the flat spring pivoted to the back of the lever. With the lever against one of the stop pins, the work is fed against the cutter. It is then withdrawn and is indexed for the next slot by moving the lever against the other stop pin. With the lever in this latter position, the work is again fed against the cutter, cutting the second slot at right angles to the first one.

■

Die for Corrugating Round Bars

JOHN TALBOT

In the process of development work in a railway equipment company's plant, it became necessary to bend ¾-in. round iron bar in corrugated form, the radius of the corrugations being ¾ in. and the distance between centers of corrugation on opposite sides of the bar 1½ in. The



work would obviously be very difficult to do by hand and since only a few bars were needed for the experimental work, an expensive die for forming them was out of the question. Male and female dies of the form shown in the illustration were made from scrap material. The female die frame is of ⅜x1½ in. stock drilled to receive the ¾-in. round bars, then bent in U-shape. The male die is a piece of ⅜x3-in. stock, drilled through its center line, then sawed through and joined by bolts as indicated. The crossbars are ordinary ¾-in. bar stock.

In forming the corrugations, which were only to be from ⅛ to 3/16 in. deep, the ¾-in. bars were heated and then placed on the male die which was located on the bed of a small press. The female die was then placed over the bars in the proper position, and the ram brought down the necessary distance. Bars produced by this method were found to be entirely satisfactory for the task and the cost of an expensive die for performing this experimental work was saved.

SEEN AND HEARD

●

A Bonus on Pinholes

MANY manufacturers contend that the day of bonuses is over. They insist that no accurate basis for the computation of a bonus can be achieved, and further that the bonus will not increase or maintain productive efficiency.

One manufacturer, at least, has selected a basis for a bonus that has proved its worth. He manufactures welded alloy steel machines and equipment for milk and fruit juice companies, and pays his welders a bonus on a basis of pinholes. Once each week, each welder is subjected to a performance test, welding several pieces of the material with which he is working. These pieces are planed to half thickness and inspected with a glass. If one pinhole appears, the welder's efficiency is ninety per cent, two pinholes make it eighty, and so on. Why such an arbitrary basis? Because users of his product have found that one pinhole may contain as many as four million germs, and will not accept a piece of equipment that shows a surface blemish. —*T.*

Massaging Springs

AGING or seasoning of metals to prevent distortion or change after the product is put into service, is a real problem. Lathe bed and similar castings were formerly stored out of doors, sometimes in the open and sometimes under cover, for several months. Automobile cylinders were similarly treated, but that was before the days of high production. Then came annealing at about 900 deg. F. after rough boring, but this is unheard of today, and yet engines run better than ever.

Steel for gages was formerly seasoned by letting it lie after roughing out the work. Now some advocate heating in water at about 200 deg. F. for various periods. One worker of delicate apparatus with a bronze spring in the mechanism finds that they act best after alternating heating and cooling by changing the temperature to which they are subjected from perhaps 100 to 200 deg. F. They also "massage" or exercise the springs before assembling in the mechanism.

Picking the Right Glass

PICKING the right glass for shop roofs, windows in partitions, or for fronts of machines where it is desired to show how they operate, isn't as easy as it looks. In one shop with a saw-tooth roof, the architect used two thicknesses of glass in the frame with the idea of its making a better insulation. He didn't count on the fact that it seems next to impossible to keep dirt from getting between the panes and once there, there is no way to get it out.

Some of the new window glass gives practically as good vision as plate glass, with no noticeable distortion. But this is only true when it is used where two thicknesses do not come together. If a glass door for example, swings in front of a glass partition, it's a wise plan to use plate glass in both places. Otherwise you can save money with the cheaper glass. —*J.R.G.*

Marketing Analysis—II

Continuation of the set of six question groups formulated by the New England Council

4. OUR SALES PLAN

No.	Questions	Answers
37	Do we maintain adequate records of sales, by items? lines? accounts? territories? salesmen?	
38	What items in our line constitute the bulk of our sales? of our profits?	
39	On what items do we lose money? Should we discontinue any of these "loss-items"?	
40	In what territories have our sales declined? Do we know why?	
41	Are our quotas broken down into amounts of "repeat" and of "new" business expected from each territory?	
42	Are our present sales outlets right as to type? location? number? methods? service to customer?	
43	Are there any new trade channels through which our goods can be moved economically to the customer?	
44	Are we cultivating the New England market as intensively as we should?	
45	Are we exporting? If not, why?	
46	Will the market absorb our output on a capacity basis? Have we any excess manufacturing capacity we should eliminate?	
47	Do we forecast and budget sales?	
48	Are we balancing our sales and our production with respect to quantities to be manufactured and carried, quality standards to be maintained, costs to be met, steady employment for our workers, and profits to be made?	
49	Who are our competitors, within our industry? outside our industry?	
50	Are we cooperating with the other members of our industry in meeting the competition of other industries?	
51	What is there in our competitors' products, services, or methods, not in ours? Should we "match" them in those matters?	

5. OUR COSTS

52	Do our manufacturing costs show costs of individual items?	
53	Can we reduce any of our costs of manufacturing without sacrificing quality?	
54	Do we know what it costs to sell each item in our line?	
55	Can we reduce any of our selling costs?	
56	Do we analyze our selling costs for their effect on our present margin of profit?	
57	What is a fair and reasonable margin of profit for each item in our line?	

5. OUR COSTS—*Continued*

No.	Questions	Answers
58	Do our prices permit reasonable profit on each item we sell? Can we increase the price of any non- or low-profit items?	
59	Do we know what is the smallest order we can profitably handle?	
60	Should we discontinue some of our less profitable items and concentrate on our more profitable ones?	
61	Are we making a profit from each account on our books? If not, should we stop selling the non-profitable accounts?	
62	Is cultivation of distant markets absorbing too much of our profit?	
63	Does our present volume at present prices and profit margins yield us a fair return on our investment?	
64	What combination of volume, price, and profit margin will give us a fair return on plant investment?	

6. OUR RESULTS

65	What is the extent of our "*cancellations*"? How can we decrease them?	
66	What do our "*returned goods*" amount to? Why are they coming back to us?	
67	What is our "*accounts receivable*" turnover? Can we increase it without loss of customer or good will?	
68	What is our annual "*dealer-mortality*"? Is it too high? too low?	
69	Are we too conservative in our discounts? or too liberal?	
70	What do our "*lost sales*" amount to? What causes them? How can we convert them into orders?	
71	Is our finished product inventory "turning over," item by item, or line by line, at the *most profitable* rate for us? for our dealers?	
72	Is our production system *flexible* enough to permit quick adjustment to fluctuations in demand?	
73	Are we utilizing *research:* to improve products; to develop new products; to cut our manufacturing costs; to broaden our markets; to better serve our customers?	
74	Do we study business *trends*: within our industry; in allied or related industries; in competing industries; in industry generally?	
75	Do we *test* the effectiveness of a policy or method before we adopt it as our standard?	
76	Do we insist that every phase, activity, or element of the business shall justify itself on the ground of profitableness?	

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Changes in Cast Iron for Machine Tools

ONE of the striking features in connection with modern machinery is the choice of materials that now enters into it. Time was, and not so many years ago, when cast iron was just cast iron, with "good gray iron" as the ideal material for machine beds and sliding parts. Then came the chilling of ways and other surfaces, followed by the introduction of nickel and other alloying elements into the mixture.

In one modern shop visited recently a careful study of all conditions and requirements has resulted in the use of three separate mixtures for different parts of the machines. Each mixture is selected especially to meet the needs of each part, and each requires special machine treatment to secure the best results.

Add to this care in the selection of material the great improvements in design and accuracy and we can see why machine builders should need no alibi for prices far in excess of those of the pre-war period.

One Kind of Installment Selling

WHEN equipment buying at a normal rate is resumed—and that time is not far off—there is likely to be a change from the old methods of doing business. Heretofore the plan of selling on installments has made little progress in the equipment field, although its intrinsic soundness has been demonstrated in other fields. Equipment builders have been reluctant to adopt the plan, and few equipment buyers have found it necessary to force the issue.

But since the first of this year it is safe to say that a considerable portion of the sales made have been on a deferred payment basis. Everyone in the industry knows how these sales were made, and why. Those who have made them have been roundly censured by some of the more conservative elements in the industry.

Is the censure justified? Yes, if those who have accepted deferred payments from a foreign buyer decline to extend equally favorable terms to domestic buyers—and there isn't the shadow of a doubt that they will be asked to do so. No, if they are prepared to adopt a deferred payment plan that is financially sound, and that applies equally to all buyers.

Equipment builders who have not thought this thing through will be wise to give it careful study. If they do not care to finance deferred payments themselves, there are capable finance companies in the business which have had years of experience and are skilled in conducting it. They are certainly going to be asked for terms, and much grief will be avoided if they are prepared with a well considered policy.

Things That Get By the Inspector

ONE of the best examples of human frailty can be found in the things that get by the inspectors in almost any line of work. And not so much in the way of accurate fits in vital parts as in the simpler things that should be obvious to anyone who touches the product. A case in point is the jack that came with a new car, one of the best known, and in the high price field.

The end of the jack handle was supposed to be flat to go in the socket in the screw. But the forger had made the flat back of the end and left a button that prevented its being used. This handle must have passed at least three men, the forger, the assembler, and the inspector, yet it got to the automobile company without being discovered. And here it must have passed through several more hands before reaching the customer.

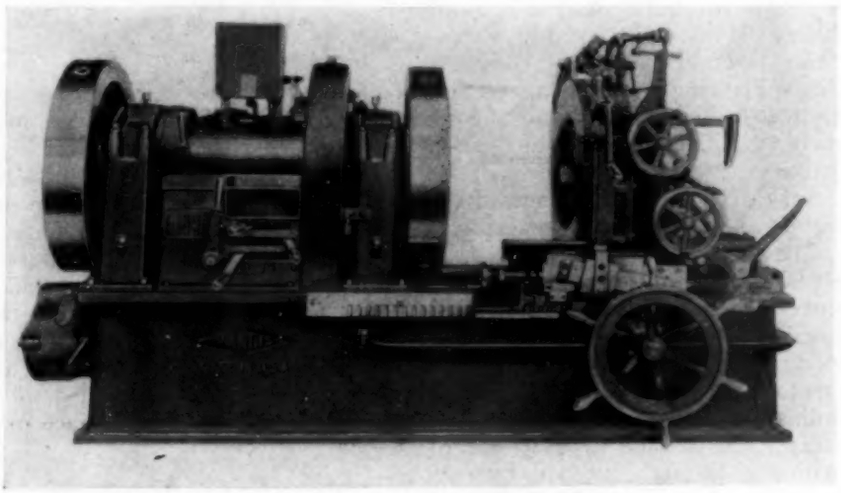
Fortunately the defect was discovered before an emergency arose, and the button was sawed off the end with a hacksaw. But what more justifiable cause for cuss words and recriminations than to discover such a blunder on the road with a punctured tire?

This instance is simply an example of the unbelievable carelessness that seems to exist in all humans. Omissions or errors that should be seen at a glance are overlooked and cause annoyance to customers, if nothing worse. Such carelessness is a menace to business and is a real problem for management. What sort of training, or penalties, or rewards, will lessen the evil?

SHOP EQUIPMENT NEWS

Landis 8-Inch Pipe Threading and Cutting-Off Machine

Long-length tapered threads now in use on high-pressure pipe and seamless tubing can be cut on the 8-in. threading and pipe-cutting machine announced by the Landis Machine Company, Inc., Waynesboro, Pa. This machine has a receding-chaser, two-cut diehead and a leadscrew attachment. The receding chaser feature adds to the accuracy and economy and makes possible the cutting of long lengths of tapered threads with narrower and therefore lower-priced chasers. It also increases the life of the chasers between grinds, particularly on the threading of seamless tubing.



Landis 8-Inch Pipe Threading and Cutting-Off Machine, which has a receding-chaser, two-cut diehead and a leadscrew for cutting long tapered threads on high-pressure pipe and tubing

A chaser $1\frac{1}{16}$ in. in width is employed regardless of the total thread length. This chaser has a combination turning and threading throat. Scale and surplus stock are removed by the turning section of the throat, thus relieving the remaining portion of the chaser of the heavy duty. The same chasers can be used for any pipe size within the range of the diehead, so long as the pitch, taper, and thread form remain constant.

The diehead is a two-cut type, which permits of roughing and finishing cuts without any change in the diametrical adjustment. Both the roughing and finishing cuts are controlled by the one taper mechanism. An independent adjustment of the chaser holders to and from center insures an equal distribution of the cut. The chaser holders are gibbed and are actuated by the cam ring and tapered rollers mounted on ball bearings. Adjustment for size is universal. In addition, there is a universal micrometer adjustment for gage fits. Each graduation on the micrometer dial gives a variation of 0.001 in. in diameter.

The taper mechanism generates a straight line taper. The sine bar is easily and quickly adjusted for all tapers up to and including $\frac{3}{4}$ in. taper per ft. A plug provides a positive means of locating the sine bar for $\frac{3}{16}$, $\frac{3}{8}$, and $\frac{3}{4}$ in. tapers per ft. Provision is made for taking up lost motion, which may develop from wear.

Adjustment for thread length is simply obtained. Once set, the adjustment is made permanent by a locking screw. The sine bar retarding bracket is adjustable for the length of pipe extending beyond the face of the chuck. It must be set to have contact with the sine bar at the start of the thread. An automatic safety device releases the sine bar retarding bracket, should the operator neglect to open the diehead when the leadscrew nut is disengaged automatically at the finish of the thread.

The leadscrew attachment, with change gears for the different pitches, insures accurate start of the thread and an accurate lead. The intermediate gears are mounted on a floating carrier, which simplifies the meshing operation. A single nut clamps the intermediate gears and the carrier in place.

The leadscrew nut is of the split type. In addition, there is another segment that can be adjusted longitudinally to eliminate backlash. These three bronze segments are carried in cast-steel jaws and can be replaced. The leadscrew nut is engaged by hand and is disengaged either automatically at the end of the thread or by hand. A pitch indicator is provided to assist the operator in the engagement of the leadscrew nut.

Coolant is supplied to the chasers through holes in the bore of the diehead. Quick-acting valves control the supply of the coolant to both the chasers and the cutting-off tool. Provision is made for lubricating all sliding and rotating surfaces in both the diehead and the machine.

"Sioux" No. 2000 Utility Machine

Two chucks are provided on the No. 2000 "Sioux" utility machine announced by the Albertson Company, Sioux City, Iowa. The 5-in. reamer drive chuck may be operated at 29, 46 and 69 r.p.m., the proper speed

being selected by means of the gear shift. The $\frac{5}{8}$-in. chuck is driven at motor speed and suitable for buffing, polishing, and wire brush cleaning. A guard is provided for use with this chuck. A 7-in. x $\frac{3}{4}$-in. x 1-in. hole grinding wheel is furnished, making the machine suitable for tool and general purpose grinding. Both the guard and tool rest are adjustable to the size of the wheel.

A braking arrangement stops the chucks and grinding wheel immediately when the switch is turned off, thus allowing for quick changes of tools. The main spindle operates on ball bearings. The net weight of the machine is 170 lb.

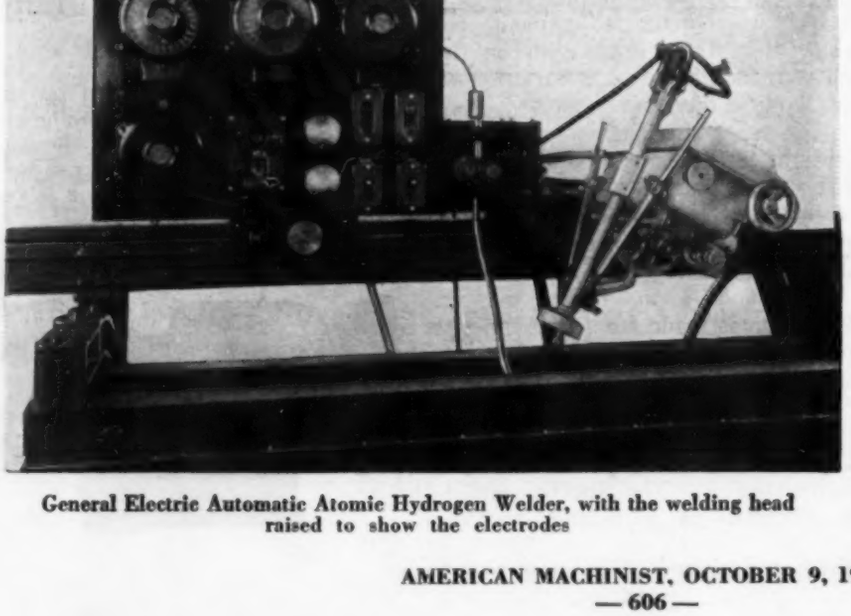
Close-up of the control panel for the G.E. Automatic Atomic Hydrogen Welder

General Electric Automatic Atomic Hydrogen Welder

One of the machines exhibited at the National Metal Exposition by the General Electric Company, Schenectady, N. Y., was the automatic atomic hydrogen welder. It is the first automatic equipment for this process, previous models being for hand welding only. This welder is designed for longitudinal seam welding of all kinds. It consists of a clamping mechanism for holding the work, an automatic travel carriage, a welding head, the usual control devices, and other accessories. The clamping mechanism and travel carriage are of standard types, while the welding head and control are of special design to suit the use of atomic hydrogen welding. In addition, there is an auxiliary feeding device for feeding filler rod into the arc, as the tungsten electrodes used to form the arc are consumed slowly and do not contribute metal to the weld.

The work is clamped in place in the usual manner, the travel carriage is set at one end of the seam, and the "start" push button is depressed. The remainder of the operation is automatic. With the pressing of the "start" button, the line contactor closes, applying power to the equipment and simultaneously opening a valve supplying hydrogen to the arc. Striking of the arc, movement of the travel carriage, and the length of the arc are all controlled automatically.

The atomic hydrogen welding process is one by means of which hitherto unweldable metals can be melted and fused without trace of oxidation, and welding can be performed in some cases on metals as thin as a sheet of ordinary writing paper. The method utilizes the passage of a stream of hydrogen through the arc between two electrodes. The heat of the arc breaks up the hydrogen molecules into atoms and these combine again a short distance beyond the arc into molecules of gas. In so doing, they liberate an enormous amount of heat and thus effective welding temperatures can be obtained. In addition, since atomic hydrogen is a powerful reducing agent, it reduces any oxides which might otherwise form on the surface of the metal. Alloys containing chromium, aluminum, silicon, or manganese can thus be welded without fluxes and without surface oxidation.



General Electric Automatic Atomic Hydrogen Welder, with the welding head raised to show the electrodes

Walcott "Airflex" Riveting Hammer

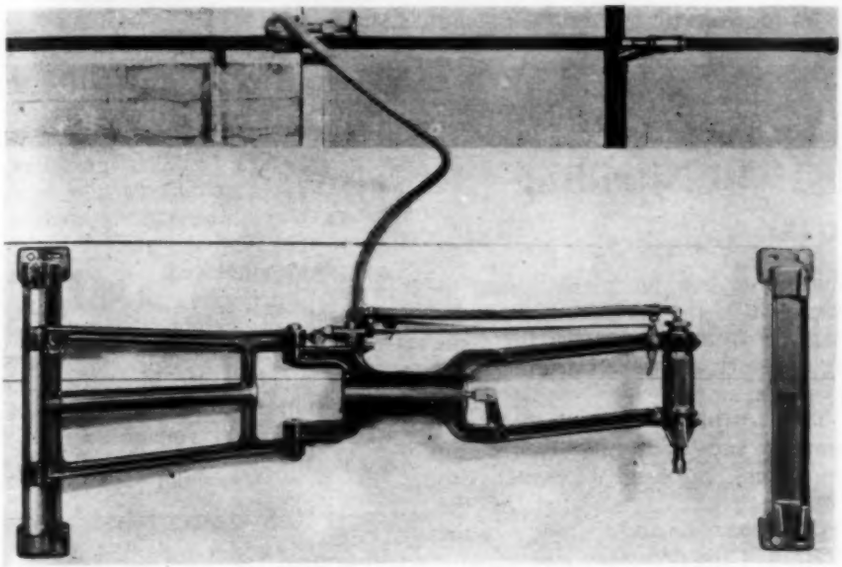
Through the use of the "Airflex" riveting hammer, developed by the Walcott Machine Company, Jackson, Mich., a wide variety of operations can be undertaken, particularly on thin or fragile stock. Among these operations are riveting, calking, chiseling, slatting, peening, and assembly operations. With the substitution of an air rotor or an electric drill for the air hammer, additional operations such as drilling, tapping, polishing, screw driving, reaming, grinding, nut setting and stud setting can be performed. The hammer is designed to handle any job requiring rivets of $\frac{3}{8}$ in. or less in diameter. Two general models are available, the wall model and the pedestal model, each in three sizes to handle $\frac{5}{32}$-in.,

¼-in., and ⅜-in. rivets, respectively. The air pressure required for the operation of all six models is 80 lb. per sq. in.

The principal feature of this tool is the patented holding device, which makes it possible to bring the tool to any point inside a half circle having a radius of 42 in. When mounted on the pedestal holder or a post, the working range is increased to a three-quarter circle of the same radius. By adding additional elbow bracket sections, this radius can be further extended to accommodate work of almost any area. This holding device, together with a sensitive power feed control, makes the tool especially well adapted for light work. The speed and power of the hammer are regulated by a patented throttle control valve adjustment, by which the operator can vary the blow from a mere vibration to get 4,000 full force blows per minute. Further economies claimed for the tool are derived out of its portability and convenience of setting up by means of the holding device, which can be slipped into a bracket mounted on the wall or on a post at any convenient place. Thus the necessity for moving large piles of work is eliminated, and the flexibility of the device eliminates the necessity for holding or moving the work during the riveting operation. By placing the work on a bench or on the floor, the operator is able to reach any and every point that is to be riveted.

On many operations it has been found necessary to use screws or bolts for fastenings in place of rivets, because the riveting process would break the piece, throw the heads off center, or bend the rivets. But because of the speed and power control embodied in the Walcott "Airflex" hammer, it is claimed that rivets may be substituted for the more expensive screws or bolts, and that it is possible to rivet fragile materials, and thus cut assembly costs. It is adapted for peening over long rods, suspended rivets, penons (round, square, or rectangular), shoulder rivets, studs, small gear shafts, threadless parts, and laminations in armature and motor fields, and for heading up long rods and wires.

Standard equipment includes one bracket for mounting the holding device, an air hammer, 6 ft. of air hose, and one peen suitable for the work intended.



Quick set-up and wide working area are features of the Walcott "Airflex" Riveting Hammer, which may be used for fragile material and rivets up to ⅜ in. diameter

Starrett No. 199 Master Precision Level

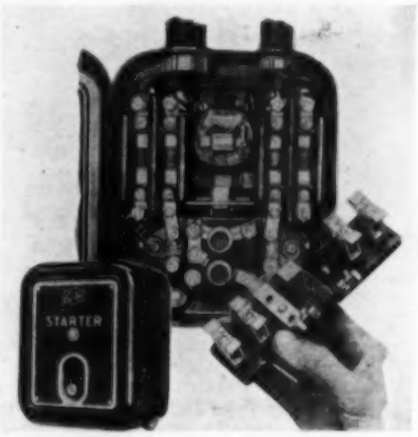
A precision level for set-up men and manufacturers of machinery has been developed in the form of the No. 199 master precision level by The L. S. Starrett Company, Athol, Mass. Since present day production and accuracy, to a large degree, depend on the levelness of the set-up, use of the instrument precludes machines being erroneously condemned when the whole fault lies in improper leveling.

With this level, the operator can read and readily figure the exact variation from level and make the necessary adjustments. The main ground and graduated vial of 10 seconds accuracy has divisions equaling ½ thousandth of an inch per ft. An auxiliary level is provided to show position laterally. The level vials are set so that breakage is reduced to a minimum. A special alloy iron is employed to obtain freedom from thermal effects. Non-machined surfaces have a black crackle finish. A non-conductive material on the top plate prevents heat of the operator's hand affecting the accuracy of the level. The length of the device is 15 in.; height, 3 in.; width, 1½ in.; and the weight about 5½ lb.

Starrett Master No. 199 Precision Level for erecting and testing machinery

Cutler Hammer "Twin Break" Magnetic Contactor

The entire line of Type AAA automatic starters for small a.c. motors has been redesigned by Cutler-Hammer, Inc., 80 12th St., Milwaukee, Wis., to incorporate a "Twin Break"



magnetic contactor. This contactor provides for reducing the arc voltage by half, and the Thermoplax arc pockets, by reducing the air content around the contacts, actually prevent the formation of a destructive arc. The contacts are of heavy coin-silver and the arc pockets act as a shield, so that wires which are run along the side of the contactor cannot interfere with its operation.

A magnetic latch has been added to prevent accidental closure of the contacts, if the starter is accidentally bumped or tilted. Before the contacts will close, the latch must be drawn aside by the operating magnet. The contactor is made in three- and four-pole types, the maximum rating for two- or three-phase circuits being 3 hp., 110 volts; 5 hp., 220 volts, and 7½ hp., 440 or 550 volts.

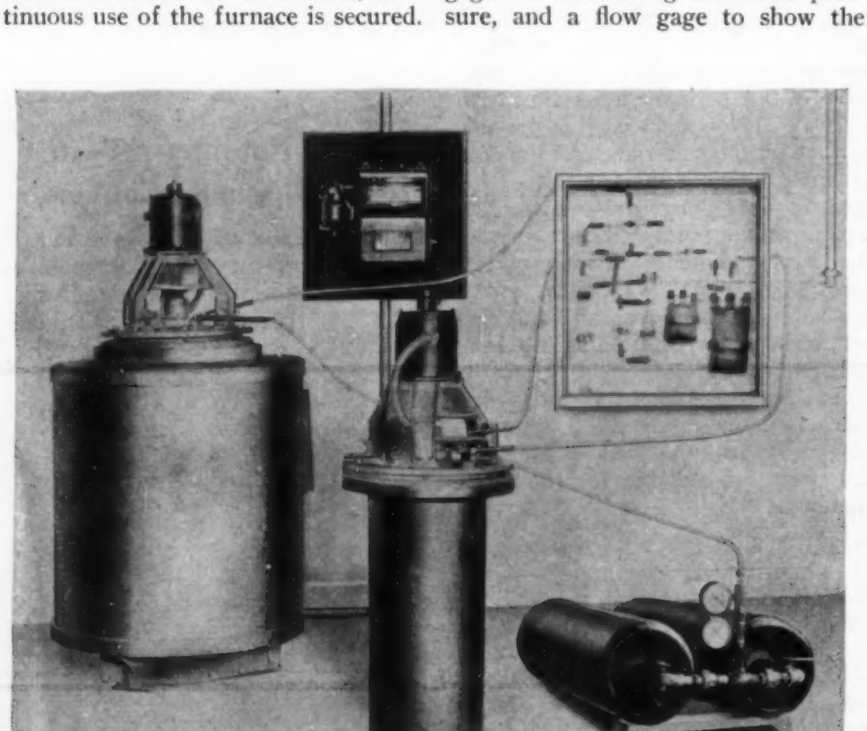
Hevi-Duty Type HD-1020 Nitriding Furnace

Small production requirements for nitriding parts can be met with the HD-1020 nitriding furnace developed by the Hevi-Duty Electric Company, Milwaukee, Wis. This furnace is a standard Hevi-Duty crucible type, having the regular nickel-chromium coil. The nicked-chromium retort is placed in the furnace chamber and bolted to the furnace cover. Within the retort, the work is placed in perforated baskets, which rest on the bottom of the retort. The retort and cover function as a unit for insertion or removal from the furnace. By the use of two such assemblies, continuous use of the furnace is secured. The retort can be gassed prior to placing it in the furnace and can be removed from the furnace for cooling the work after the nitriding cycle is complete.

The control equipment includes indicating and recording controlling pyrometers, a control panel, two thermocouples, one located in the furnace chamber and the other in the retort, and the necessary lead wire.

As shown in the illustration, two ammonia tanks are connected to a common manifold. Two gages are placed on the manifold, a pressure gage for measuring ammonia pressure, and a flow gage to show the amount of gas flowing through the furnace. Dissociation equipment consists of pipettes and bubble bottles, which measure the rate of dissociation, and are designed to permit the use of the exhaust gas of the heating retort for gassing the remaining retort, which has been charged with work ready for the next heat. The complete cycle of gassing, heating, and cooling requires approximately 30 hours for the type HD-1020 nitriding furnace. Of this time, the charge is in the furnace approximately 24 hours. The charge, during this time cycle, acquires a case depth of from 16 to 20 thousandths, depending on the type of steel and the temperature employed.

The dimensions of the type HD-1020 are: height, 68 in.; diameter, 48 in.; retort height, 20 in., and retort diameter, 10 in. Electrical specifications: kilowatt rating, 18; phase, 1; and voltage required, 230 a.c.



Hevi-Duty Type HD-1020 Nitriding Furnace for laboratories and limited production requirements

Federal Model 390 Dial Thickness Gage

Flat stock that must be held within a few ten-thousandths can be measured with the model 390 dial thickness gage developed by the Federal Products Corporation, Providence, R. I. This gage is graduated in ten-thousandths, the range being 0.100 in. A throat depth of ¾ in. is provided and the anvils are hardened and ground, either flat or ball pointed. Otherwise, the gage is similar to an older model graduated in 0.001 in. divisions.

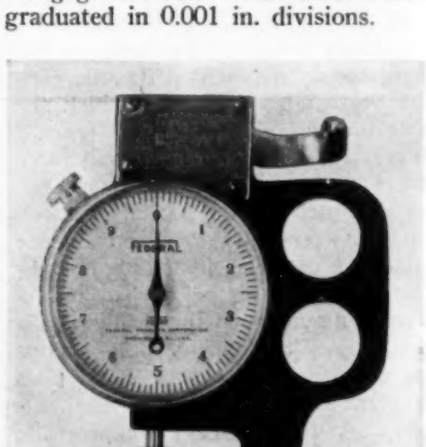


Fig. 1—"Standard" Type A.M. Standard Spot Welder, pedal-operated type, for two sheets up to $\frac{5}{16}$ in. thick

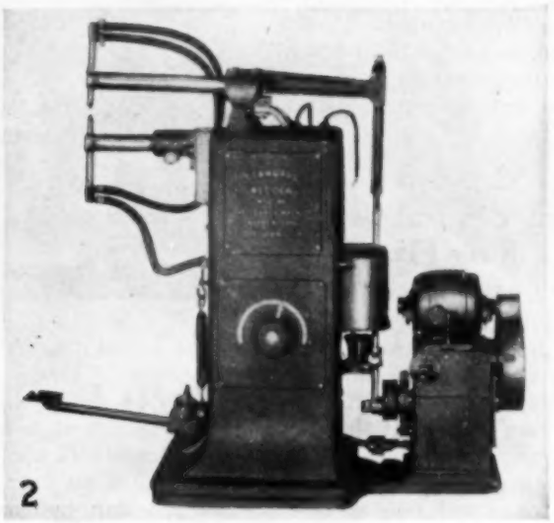


Fig. 2—"Standard" Type A.L., Automatic Spot Welder rated 10 kva. and giving from 60 to 120 spots per min.

"Standard" Spot Welders

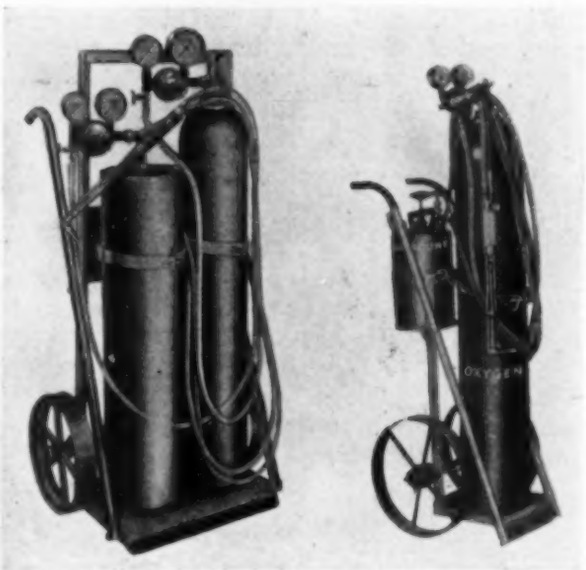
Medium heavy-duty and light-duty spot welders, placed on the market by The Lenney Machine & Manufacturing Company, Warren, Ohio, are available in both pedal and automatic types. The Type A.M. standard spot welder, shown in Fig. 1, is suitable for duty up to 25 kva. and will weld two sheets of thin metal up to $\frac{5}{16}$ in. thick. It is made in the pedal type and also in automatic type having four speeds from 60 to 120 per min. The regular horns on this machine are 18 in. long, but other lengths can be furnished. The maximum distance between the horns is 12 in. Points are interchangeable and water-cooled. The Type A.M. is built for continuous operation at high speed. Floor space required is 24x40 in., and the shipping weight of this model is 1,000 lb.

The Type A.L. standard spot welder, shown in Fig. 2, is a 10 kva. model, which will weld two pieces of 16 gage or lighter. The horns on this machine are 12 in. in length, but other lengths can be furnished. Maximum distance between the horns is 10 in. Interchangeable, water-cooled points and a high efficiency transformer are also supplied. The welder, which is intended primarily for continuous production on light-gage metal, requires only 20x30 in. of floor space, and the shipping weight is 425 lb. This type is also available in an automatic machine. Other models are available for purposes requiring up to 500 kva.

Torchweld Gasoline Metal-Cutting Torch

Reduced weight is the primary feature of the gasoline metal-cutting torch developed by the Torchweld Equipment Company, Chicago, Ill. As compared with the oxy-acetylene equipment shown at the left of the illustration, the gasoline metal - cutting torch weighs 220 lb. less, and will perform as much work with a two-gallon can of gasoline as the larger equipment would do with a heavy gas cylinder. This reduction of weight permits easier handling, quicker setting up, and rapid transportation of the equipment, saves storage space, and permits the use of the equipment on floors whose safe loading runs little beyond the weight of the equipment. Small plants located in remote places can use the meta-cutting equipment because of the prevalence of gasoline. Another benefit resulting from the use of gasoline as a fuel is that storage space for cylinders is eliminated. Should the operator run short of gasoline, it can be secured easily and the apparatus put back into operation before a gas cylinder could be found and substituted for the empty one.

The equipment consists of a cutting torch with four gasoline cutting tips.

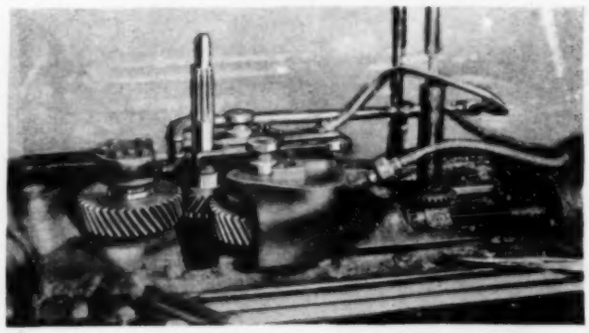


Illustrating the saving in weight of the Torchweld Gasoline Metal-Cutting Torch as compared with oxy-acetylene equipment

25 ft. of high-pressure oxygen hose, 25 ft. of flexible, metallic gasoline hose, a 2-gal. welded gasoline tank, a high-pressure, two-gage oxygen-cylinder regulator; wrenches, goggles, and gloves.

Bolender Spiral-Gear Burnishing Fixture

A simple holding fixture for burnishing spiral gears has been developed by the City Machine & Tool Works, East Third at June Sts., Dayton, Ohio. Ordinarily, when spiral gears are burnished they tend to crawl out of position. When burnished in one direction the spiral gear tends to crawl one way and when burnished in the other direction it tends to crawl in the opposite way. Downward thrust, of course, can be taken care of readily by supplying a flat plate as a part of the approximate locator itself, but the upward thrust would require a different arrangement. Thus, the fixture developed by the above concern checks the up thrust of a spiral gear while being burnished, while the downward thrust is taken care of by the previously mentioned locator plate. In order to assure uniformity, however, the complete burnishing cycle includes a determined number of revolutions in one direction, immediately followed by an equal number of revolutions in the opposite direction.

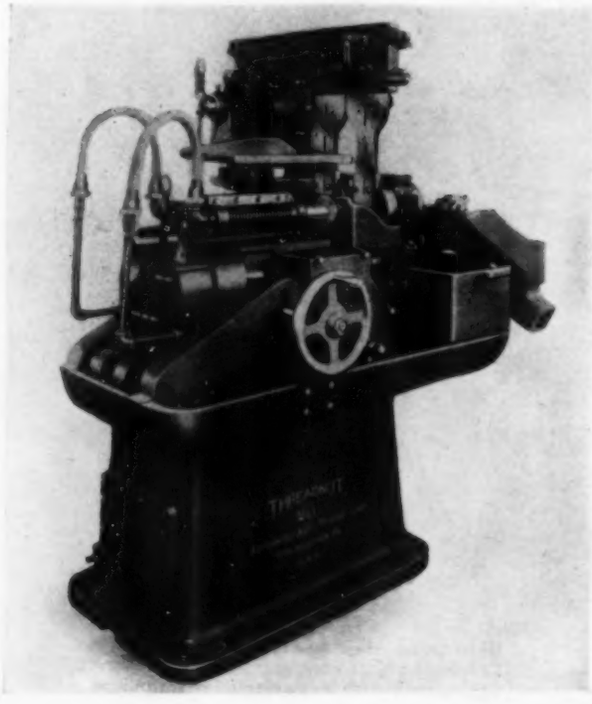


"Threadnut" No. 1 Double-Spindle Automatic Nut Tapping Machine

A double-spindle automatic nut tapping machine for from $\frac{1}{4}$- to $\frac{7}{16}$-in. U.S.S. or S.A.E. hex and square nuts has been announced by the Automatic Nut-Thread Corporation, 3617-19 North Eighth St., Philadelphia, Pa. This machine, designated as the "Threadnut" No. 1, uses bent-shank taps, which remain stationary, the nut blanks being revolved. Both tapping spindles are fed by a single hopper of the rotary disk type. Two centrifugal pumps are provided, one for each spindle, each pump forcing coolant through a flexible steel hose attached to the tapping spindle and thence directly to the tap. Should one of the spindles become clogged, the nut pusher on the spindle affected will compress automatically and the other spindle will continue operating, until the operator has a chance to remove the obstruction.

Change gears are provided so that changes in tapping speed or lead can be made. All gears are of steel. The standard machine is furnished with a single clutch pulley for belt drive. Provision is made for application of motor drive, using hinged brackets at the rear of the machine.

Production on $\frac{3}{8}$-in., 24-thread per in. S.A.E. hex nuts at a cutting speed of 45 lineal ft. per min. has been found to be 3,120 per hour. Nuts can be tapped on these machines to a Class 4 close fit when proper attention is given to the preparation of the nut blanks and the sizing of the taps, using ground-thread high-speed steel taps.

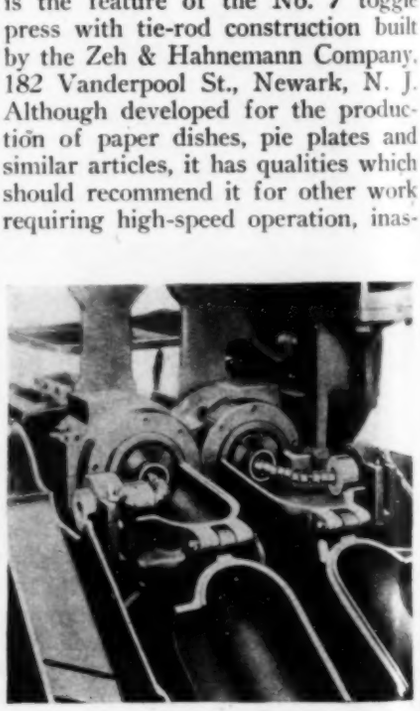


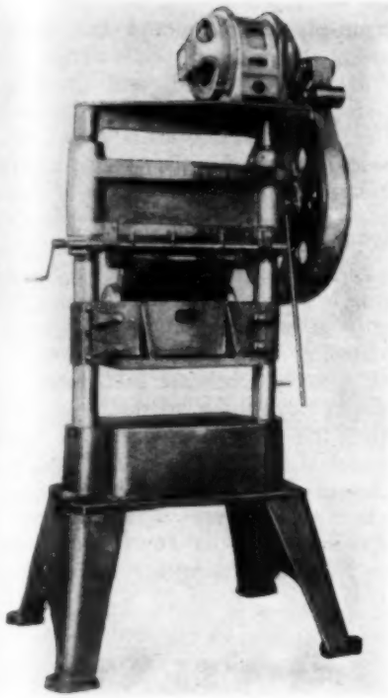
Left—3,120 $\frac{3}{8}$-in. S.A.E. hex nuts per hour have been tapped on this double-spindle machine

Right — Discharge end of the two spindles used on the No. 1 "Threadnut" Automatic Nut Tapping Machine

Zeh & Hahnemann High-Speed Toggle Press

Operation at 75 strokes per minute is the feature of the No. 7 toggle press with tie-rod construction built by the Zeh & Hahnemann Company, 182 Vanderpool St., Newark, N. J. Although developed for the production of paper dishes, pie plates and similar articles, it has qualities which should recommend it for other work requiring high-speed operation, inas-





Zeh & Hahnemann High-Speed Toggle Press, which gives 75 strokes per minute and has a slide stroke of 1½ in.

much as the normal pressure exerted is 50 tons. Specifications are: Weight of press, 4500 lbs., distance between stanchions, 26 in., stroke of slide, 1½ in., adjustment of slide, 1½ in., and horsepower of motor required, 3.

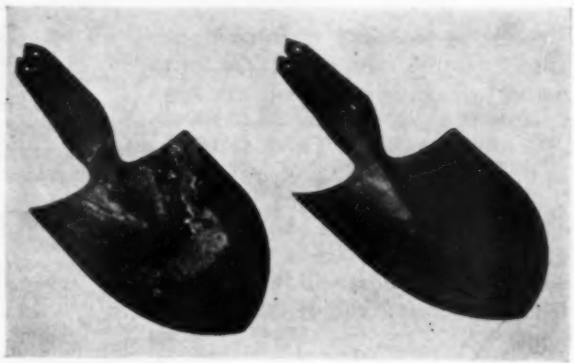
Bullard-Dunn Electro-Chemical Cleaning Process

More information has been obtained from the Bullard-Dunn Process Division of the Bullard Company, Bridgeport, Conn., on its electro-chemical cleaning process, which is particularly adaptable to ferrous metals, although its use can be attended to the non-ferrous group. Scale, oxides, and grease can be removed by the proper components of the process. If the articles are dirty and covered with grease or oil, they can be placed in an alkali bath consisting of caustic soda, soda ash, and trisodium phosphate with lead anodes. Hot and cold rinsing tanks are required. Scale and oxides are removed in an acid bath, employing sulphuric and hydrochloric acids, and common salt.

The most significant feature of the process is that no pitting occurs in the acid bath after the removal of the oxide or scale. Hydrogen is liberated under the scale or oxide by the electro-chemical action and works it loose. Immediately thereafter lead is deposited on the exposed, clean metallic surface. This lead coating is of value in subsequent deep-drawing operations and also provides a good base for plating with various metals. This lead coating may be removed by immersing the object in the alkali bath and reversing the current.

In subsequent manufacturing operations, the thoroughly de-scaled and clean products coming from this process are conducive to reduced tool cost and quick assembly, and because of this production is speeded up. Complete removal of hardening scale from dies without destruction of the contour or dimensions assures a more perfect product, unmarred as to surface and truer to designed form and dimension. Hardening cracks can be detected immediately, since these are thrown into prominent relief by the process. Of course, original defects in material, such as pipes in barstock or seams and ruptures in forgings, are also detected so that early rejection is made certain.

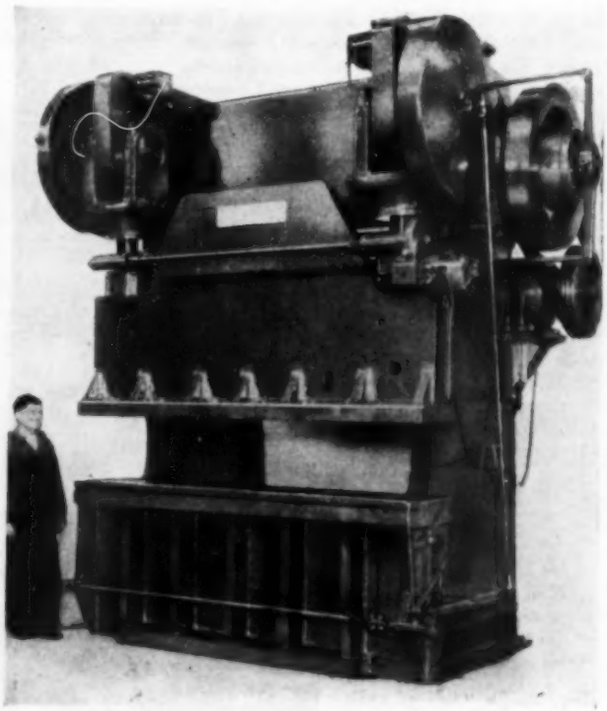
In the fabrication of stainless steel or rustless iron products, the use of the process after each annealing removes chromic oxides, and thus the production capacity of the polishing department is increased, since the effective life of a polishing wheel is materially lengthened by the preliminary elimination of chromic oxide from the surface to be polished. Finally, no chromic-oxide particles are present to act as foci for general surface corrosion.



The "before" and "after" when badly scaled and rusted products are treated by means of the Bullard-Dunn Electrochemical Cleaning Process

Cincinnati 300-Ton, Single-Acting Double Crank Press

An all-steel, 300-ton, single-acting, double-crank press has been built recently by the Cincinnati Shaper Company, Elam St. & Garrard Ave., Cincinnati, Ohio. All main members of this press are of rolled steel plate; the housings being 5¾ in. thick, and the bed and ram plates 4 in. thick. Welding is used throughout. The stroke



Cincinnati All-Steel, 300-Ton, Single-Acting, Double-Crank Press, which has a die area of 17½ in. x 8 ft., and a shut height of 20 in.

of the press is 3 in.; motorized adjustment to the ram, 6 in.; die area 16½ in. by 8 ft.; die area of bed, 17½ in. by 8 ft.; shut height, 20 in., and depth of throat, 10 in. Other features are the automatic oiling, V-belt drive to flywheel, bronze-bushed eccentric bearings, and flywheel and ram adjustment mounted on anti-friction bearings. The press will be used for multiple punching and riveting operations.

TRADE PUBLICATIONS

BENCH MACHINES. The Wade Tool Co., Waltham, Mass., successor of the American Watch Tool Co., has issued a folder illustrating and describing a motor-driven profiling machine, and a No. 3 screw-chasing lathe, both of which are bench types.

CHAIN DRIVES IN STOCK. The Diamond Chain & Manufacturing Co., Indianapolis, Ind., has issued a 64-page book No. 78 on stock chain drives intended for a majority of motor and countershaft applications requiring from ¼ to 75 hp., in ratios up to 8.4 to 1, and with motor speeds of 1,800 r.p.m. Complete tables, applications, and advantages are incorporated.

A CONSISTOMETER FOR GREASES. The U. S. Department of Commerce, Bureau of Standards, has issued Research Paper No. 188 entitled "A New Consistometer and Its Application to Greases and to Oils at Low Temperatures" describing a consistometer suitable for determining consistencies of greases and plastic materials in general, and for obtaining the flow-pressure diagram for materials which change rapidly in consistency with time.

DIEHEADS. The Landis Machine Co., Inc., Waynesboro, Pa., now has available bulletin No. F-72 on "Landex Heads for Automatic Screw Machines," also showing the head with internal tripping mechanism. Construction details, specifications, and methods of application are included.

GOODELL-PRATT CATALOG. Regrouping of the classifications of the tools manufactured by the Goodell-Pratt Co., Greenfield, Mass., in catalog No. 17 is for the convenience of the reader. In the 416 pages are shown screw drivers, an automatic drill, micrometers, hack saw frames, woodworking lathes, bolts, chisels and punches, and a heavy-duty workshop.

MOTORS. The Master Electric Co., Dayton, Ohio, has added Data Book Section 202 on single-phase motors of the repulsion-induction type for a.c. circuits. The type RA motors are available from $\frac{1}{30}$- to 5-hp. sizes, inclusive.

ROCKWELL VS. BRINELL NUMBERS. The U. S. Department of Commerce, Bureau of Standards, has issued Research Paper No. 185 entitled "Relationships Between Rockwell and Brinell Numbers," comparative tests being made on a great variety of ferrous and nonferrous metals.

STEEL, HIGH-SPEED. The Firth-Sterling Steel Co., McKeesport, Pa., now has a new booklet on "Circle C" super high speed steel and "Blue Chip" high speed steel. Performance and heat-treatment data are given for Circle C and heat-treatment data for "Blue Chip." Sizes, shapes and extras are included.

TESTING MACHINES. The Tinius Olsen Testing Machine Co., 500 No. 12th St., Philadelphia, Pa., has issued catalog No. 50, Part A, giving over 152 pages on testing machines and instruments for a very wide variety of purposes. Each machine is illustrated, capacities are listed, and a complete description is given of each.

Improved Fulcrum-Pin Bearings on Canton Alligator Shear

In order to simplify rebushing of the fulcrum-pin bearings on its alligator shears, the Canton Foundry & Machine Company, Canton, Ohio, has developed a split gun-metal bushing, illustrated in Fig. 1. Heretofore, it has always been a difficult and lengthy job to rebabbitt or rebush the fulcrum-pin bearings and has usually meant taking out the fulcrum pin, removing the head, and practically dismantling the shear. A step down fulcrum pin is now used, which when assembled in the shear with the two castellated nuts, serves as a tie to prevent the shear bed from spreading. When the fulcrum-pin bearing becomes worn and needs rebushing, it can be accomplished without taking out the fulcrum pin, and without dismantling the shear. It is necessary only to take off the castellated nuts and remove the hardened steel collars and the cast-steel clamping plates attached to the shear. Then the four cap-screws taken from the clamping plate are inserted in tapped holes in the flange of the gun-metal bushing to serve as pulling screws.

Fig. 1—Completely assembled split gun-metal fulcrum-pin bearing on the Canton Alligator Shear

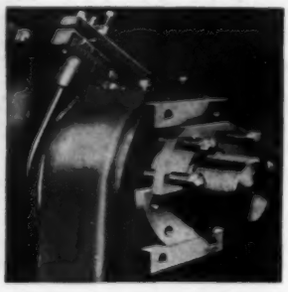


Fig. 2—Top half of split bushing being removed

PATENTS

September 30, 1930

Metal-Working Machinery

Machine Tool. Johan Vilhelm Löf, Stockholm, Sweden. *Patent 1,776,976.*

Method and Machines For File Grinding. Herbert L. Bailey, Philadelphia, Pa. *Patent 1,777,135.*

Automatic Multiple-Spindle Machine. Louis H. Blood, Cincinnati, Ohio, assigned to Reading Automatic Machine Co. *Patent 1,777,251.*

Tools and Attachments

Protective Device for Use in Hot-Metal Ladles. Francis L. Arensberg, Pittsburgh, Pa., assigned to Vesuvius Crucible Co. *Patent 1,776,773.*

Intermediate Table for Double Shears. Leroy G. Leichner, Ashland, Ky., assigned to The American Rolling Mill Co. *Patent 1,776,861.*

Tool For Reaming And Fitting Valve Seats. George E. Moen, Kelso, Wash. *Patent 1,777,047.*

Shell Reamer. John G. Matthews, Berea, Ohio. *Patent 1,777,124.*

Self-Centering Cutter Head for Precision Boring Machines. Helge Jacobsen, Skaererivej, Glostrup, Denmark, assigned to William Thomsen, Copenhagen, Denmark. *Patent 1,777,265.*

Processes

Making Flange Tubes and the Like. Henry S. Holmes, New York, N. Y., assigned to Metropalitan Engineering Co. *Patent 1,776,855.*

Method and Apparatus for Making Flanged Containers. Horace H. Clark, New York, N. Y. *Patent 1,776,888.*

Cutting The Efficient Curve In The Walls of Helixes. Almer Newton Blazer, Mescalero, N. Mex. *Patent 1,777,250.*

NEWS OF THE WEEK

Pratt & Whitney's 70th Birthday Party

FRED H. COLVIN

IN 1860, Francis A. Pratt and Amos Whitney started their business venture as a side issue while both were employed by the old Phoenix Iron Works in Hartford, Conn. On Oct. 1, the present executives and 175 of the employees who had been with the company for 20 years or more celebrated the 70th birthday of the company, ending with a banquet to 400 men at the Hartford Club. The 20-year men were the youngsters of the party, for there were nine men with service records of from 50 to 63 years, and many in between. Could there be a better tribute to the basic fairness of the management through the years or a more striking example that the 40-year deadline is a mistaken idea?

Clayton R. Burt, president and general manager, presided, introducing the impressive novelty of a telephone conversation with Hugh L. Purdy and other representatives connected with the Buck & Hickman organization in Great Britain. There were short addresses by Clarence E. Whitney, son of the founder, and by Ambrose Swasey, who was formerly employed by Amos Whitney and who gave a most animated and interesting talk concerning the old days in the shop. George A. Long, another old employee, Henry D. Sharpe, and Col. E. A. Deeds also told of conditions both old and new, Col. Deeds being particularly optimistic.

As a permanent memento of the occasion, each guest received a booklet outlining in a concise and interesting manner the achievements of the company during the three score years and ten of its existence. This emphasizes the constant striving of both the partners and of those who followed. No one can fail to be impressed with the versatility of the two men, with the vision that led them to spend large sums in research when that practice was generally considered as a waste of time.

It is one thing, however, to start and to build a great business, but it is quite another to take up the reins after the founders have attained success and to carry on in the face of changing conditions and increased competition, and through it all to cling tenaciously and persistently to the ideals of ever increasing accuracy. We must not in all fairness overlook the work of those who have rebuilt the company and are carrying it on in line with modern requirements.

G. E. to Erect Million-Dollar Building

Plans for a new manufacturing building to cost $1,000,000, to be erected at the Pittsfield plant of the General Electric Co., immediately, have been announced by E. A. Wagner, general manager of the works. The structure will be devoted to the exclusive manufacture of transformer tanks and when completed will be the largest transformer tank shop in the world. It will be more than 550 ft. long, 150 ft. wide, and 70 ft. high and will be all welded—probably the largest welded building of its kind. Construction will take nearly four months. Present plans provide that the entire building will be of steel and glass on a concrete foundation. In connection with the main building there will also be an extension 350 ft. long by 27 ft. wide, to be used for the various manufacturing and production offices. This will be similar to the main building in construction details. The new buildings will add more than 93,000 sq.ft. of floor space.

Munitions Production To be Discussed

Plans of the War Department for the production of munitions by American manufacturers in the event of another war will be the main topic of addresses and papers to be presented by authorities at the first session of the twelfth annual meeting of the Army Ordnance Association to be held in the Auditorium of the U. S. Chamber of Commerce on Wednesday evening, Oct. 8. The Assistant Secretary of War, Hon. Frederick H. Payne, who is especially charged with the mobilization of industry for the manufacture of armament, will address the assembly on the plans of the War Department in munitions production.

Courtesy of Cincinnati Milling Machine Company

The famous Oakley Colony of machine tool plants, Cincinnati, Ohio. A central power plant furnishes heat, light, compressed air, and power to the various plants in the group

Industrial Machinery Exports Decline—Trade Practice Policy Protested

PAUL WOOTON
Washington Correspondent

WASHINGTON, D. C., Oct. 8—Exports of industrial machinery during August were valued at $15,613,558. This is $6,330,000 less than the value of exports in August, 1929, and $2,375,000 less than exports in July.

Comparative figures covering the major sub-divisions of industrial machinery follow:

	August, 1930	August, 1929	July, 1930
Power generating machinery	$1,342,289	$2,583,981	$1,507,130
Construction and conveying machinery	1,290,416	2,378,104	2,295,839
Mining and pumping machinery	3,327,759	4,204,121	3,280,795
Power driven metal-working machinery	2,193,113	2,315,109	2,895,309
Other metal-working machinery	490,664	566,866	490,576
Textile machinery	690,900	700,349	641,170
Sewing machines	445,936	786,712	401,791
Other industrial machinery	5,601,334	8,105,994	6,289,571

It will be noted that textile machinery and sewing machines are the only items showing an increase over July. All the above items show a decrease as compared with August of last year.

The detailed figures covering power driven metal-working machinery follow:

	August, 1930	August, 1929	July, 1930
Engine lathes	$97,244	$139,664	$231,774
Turret lathes	40,641	55,169	117,755
Other lathes	123,853	177,632	94,468
Vertical boring mills and chucking machines	26,994	25,505	67,932
Thread cutting and automatic screw machines	47,193	121,082	79,205
Knee and column type milling machines	77,678	111,596	76,943
Other milling machines	224,550	94,321	162,841
Gear cutting machines	41,864	93,792	108,594
Vertical drilling machines	18,578	43,863	34,923
Radial drilling machines	11,477	23,221	34,512
Other drilling machines	42,940	57,117	124,332
Planers and shapers	79,105	96,473	34,259
Surface grinding machines	15,389	18,917	6,880
External cylindrical grinding machines	65,826	150,444	159,146
Internal grinding machines	44,679	103,125	31,529
Tool grinding, cutter grinding and universal grinding machines	66,409	49,349	92,325
Other metal grinding machines	48,785	62,268	63,719
Sheet and plate metal-working machines	27,192	112,976	222,344
Forging machinery	127,008	114,022	156,926
Rolling mill machinery	64,052	86,902	88,457
Foundry and moulding equipment	306,756	153,804	527,272
Other power driven, metal-working machinery and parts	344,900	423,867	379,193

Exports of power generating machinery, except electric and automotive, in August totalled $1,342,289. This represents a decrease of nearly one half in the volume of exports in August, 1929, and a decrease of $164,841 over July of this year. Other items on the list, except mechanical driven turbines, show a falling off as compared with the movement in the corresponding month of last year.

Exports of aeronautical equipment for the eight-month period ended August 29 were larger in two classes than for the same period last year, although the total valuation runs slightly under the 1929 figure. For 1930 the total appraisal of exports for the first eight months is $6,214,720, whereas the 1929 figure is $6,469,870. Engines, and parts and accessories, excluding tires, are increased.

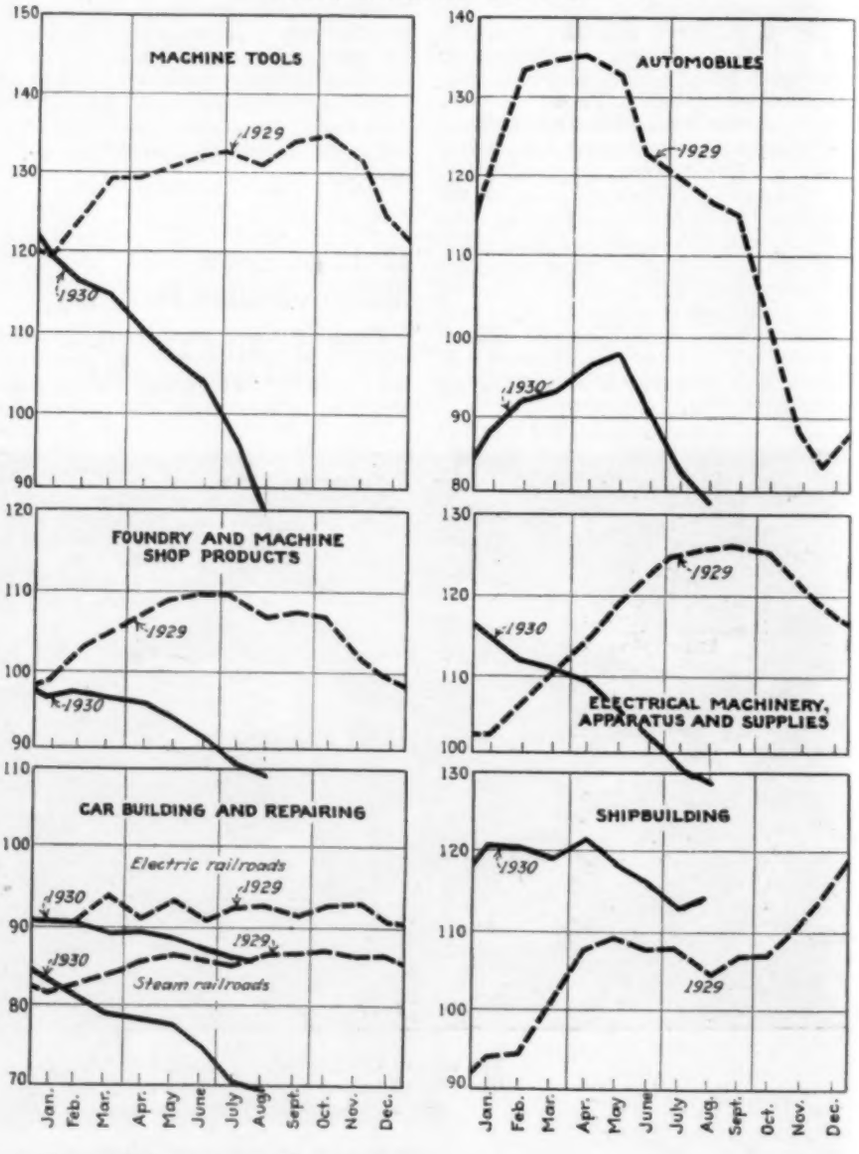
Henry P. Fletcher, chairman of the Tariff Commission, announced on Sept. 29 the rules of procedure under which the Commission, 30 days hence, will commence rewriting the 1930 tariff. The rules are designed to expedite investigations made by the Commission under the revamped flexible tariff provisions of the law. The effect of the commission's new rules is to place the burden of proof upon the applicant for an increase or decrease in the statutory rate.

In protesting so vigorously against the Federal Trade Commission's abrupt reversal of its policy on trade practice rules, the American Trade Association executives very deliberately went over the Commission's head to compel President Hoover's attention. Although the commission is technically an independent government establishment, it is responsive to White House suggestions.

Trend of Employment In the Metal-Working Industries

Data Supplied by the Bureau of Labor Statistics

Monthly average for 1926 = 100



Gear Manufacturers Meet in Canada

Under the presidency of B. F. Waterman, the fourteenth semi-annual meeting of the American Gear Manufacturers' Association swung into action on Sept. 29, at the Hotel Clifton, Niagara Falls, Ont. Following the normal routine reports and communications, G. L. Markland, Jr., outlined real progress in his work with the U. S. Chamber of Commerce and the American Standards Association. A. A. Ross, chairman, reported for the General Standardization Committee, giving the meeting a historical summary of the work of the association. The Library Committee recommended that a manual of gear standards be prepared.

A proposed revision of recommended practice for computing the horse-power of non-metallic spur gears composed of laminated phenolic materials or rawhide was proposed by H. R. Moyer, chairman of the Non-Metallic Gearing Committee, and accepted. A. A. Ross substituted for G. Bartlett, chairman, in the report of the Sprocket Committee. A. B. Pierce of the National Metal Trades Association addressed the meeting on "Foremen and Foremanship Training." On Monday evening, C. B. LePage, assistant secretary of the A.S.M.E., presented his paper, "A Look Ahead in Gear Standardization and Research." The whole of Tuesday was set aside as "Commercial Standards" day, with A. A. Ross presiding; Albert E. Grover, cost accountant, National Machine Tool Builders' Association, presented the costing methods in use by the members of his association. Discussion was full and free. Tuesday evening, J. H. Jackson presided at the continuation of the Commercial Standards Session, delivering a prepared paper on a problem in gear costing.

On Wednesday, D. T. Hamilton, chairman, presented a "Proposed Suggested Standard for Future Design" for the Gearing Nomenclature Committee. Owing to some division of opinion as to the inclusion of certain formulas, this carefully prepared project was referred back to the committee.

Professor V. O. Homerberg, Massachusetts Institute of Technology presented "Nitro Alloy Steels," and Professor Earle Buckingham of the same institution, "Nitro Alloy Steels in Gears," both excellent papers.

The spring meeting of the A.G.M.A. will be held on May 7, 8, 9, at the Hotel Statler, Buffalo.

Gray Iron Report Shows Trade Pick-Up

For the first time in several months there is an improvement noticeable in general business conditions, according to the August trade report of the Gray Iron Institute, Inc. New business, as indicated on the report, increased over July, as did also unfilled orders and material received. The business outlook also shows an improvement. The greatest activity was enjoyed by foundries with normal production of less than 100 tons per month, and the greatest activity by districts was enjoyed by foundries in District No. 2, which includes the Dominion of Canada, the New England States, New York, and New Jersey. Production shows 123 per cent for August, 1929, and 62.8 per cent for August, 1930, as compared with 63.6 per cent in July. These percentages are in ratio to the total normal production for the number of foundries shown. New business showed 56.3 per cent in August, as compared with 54.2 in July, and 122.3 in August, 1929. Unfilled orders increased from 32.7 in July to 48.4 per cent in August, compared with 88.1 in August, 1929. Material received increased from 53.5 to 63.3 per cent, as compared with 134.7 per cent in August, 1929, while material on hand decreased from 148 in July to 129.7 in August, 1930, as compared with 151.1 in August, 1929.

T. R. Watts, Westinghouse Research Laboratories, testing a butt weld by the magnetic test he devised and which he described before the A.W.S. in Chicago. Tests are made by "bridging" the seam with a large horseshoe electro-magnet, and "exploring" the magnetic field in the vicinity of the weld with a meter

Machine Pins Standard Out for Criticism

A proposed American Standard, in tentative form, for Machine Pins, both taper and cylindrical, has been developed recently by the Sectional Committee on Machine Pins of the American Society of Mechanical Engineers and is now being distributed to industry for criticism and comment. The Sectional Committee consists of men representing manufacturers, users, and those generally interested in the subject throughout the country. It was organized in March, 1926.

The taper of the proposed series is maintained at $\frac{1}{4}$ in. per ft., or a taper of 1 in 48. The small diameter of the pins is in the usual fractional dimensions, spaced by thirty-seconds from $\frac{1}{32}$ to $\frac{5}{32}$ in. diameter, by sixteenths to $\frac{3}{8}$ in. diameter, by eighths to $\frac{3}{4}$ in. diameter, and by quarters to $1\frac{1}{2}$ in. diameter. The number of diameters is reduced from 20 to 14 with a better arrangement of spacing. Ends on these pins have a rounded edge with a radius of $\frac{D}{4}$ in. Lengths are limited to between 4 to 12 times the small diameter and vary in logical progression so that minimum variety will serve maximum utility. The series proposed as an American Standard agrees with general practice abroad.

Criticisms and comments of the proposed standards should be mailed to C. B. LePage, Assistant Secretary, A.S.M.E., 29 W. 39th St., New York.

Iron & Steel Institute Meets on October 24

The thirty-eighth general meeting of the American Iron and Steel Institute will be held in the Hotel Commodore, New York, N. Y., on Friday, Oct. 24. Three sessions are scheduled, forenoon, afternoon, and banquet in the evening. Five papers to be presented include: "The Structures of High-Chromium Steels and Irons," "Transportation Within the Steel Plant," and "Some Recent Developments in the Cold Rolling of Strip Steel."

Standards Bureau Issues Recommendations

Simplified Practice Recommendation R97-30 on Bell Bottom Screw Jacks, issued on June 12 by the U. S. Bureau of Standards, has been accepted by a sufficient number of manufacturers, distributors, and users to make it effective as of Oct. 1. Simplified Practice Recommendation R94-30 on Open Web Steel Joists was also accepted as of Oct. 1.

BUSINESS ITEMS

Cutler-Hammer, Inc., 12th & St. Paul Ave., Milwaukee, Wis., has moved its Philadelphia sales office to the tenth floor of the new Terminal Commerce Bldg., 401 North Broad St. F. J. Burd is manager of the Philadelphia district.

Cornell & Underhill, pipe manufacturers, located in New York City for more than 40 years, will move early next year to a new plant in Hoboken, N. J. The plant covers the block at 14th & Madison Sts., and buildings to be erected will be 200x400 ft.

The General Brass Foundry Co., Inc., Brooklyn, N. Y., has purchased the Sweet Foundry on Chestnut Ave., at the foot of Coit St., Irvington, N. J.

The Hughes Tool Co., Houston, Texas, has taken out a permit for a pattern shop building 168x72 ft., the cost of which will be about $40,000.

Westman Machine Works, Toronto, Ont., has leased the building on Ritson Road, North, Oshawa, Ont., at one time occupied by the McCullough Foundry Co., and will occupy the plant within the next week. The name of the company will be changed to Westman Machinery Co., Ltd.

A research laboratory to speed production of "Firthite" has been opened recently by the Firth-Sterling Steel Co., McKeesport, Pa. The laboratory will continue research work into regular steel products, especially "Chromovan." The laboratory represents a $200,000 investment. Gregory J. Comstock is in charge.

The Steeples Engineering Co., 2910 First Ave., South, Seattle, has appointed the Feenaughty Machinery Co., 1028 6th Ave., South, Seattle, as Northwest distributors. Equipment will be carried in stock at Seattle, Spokane, and Portland.

The Fuller Lehigh Co., Fullerton, Pa., has removed its Cincinnati office from the Traction Bldg., to Carew Tower. H. E. Martin will continue in charge as manager.

The Dayton (Ohio) Airplane Engine Co., on the completion of its merger with the Pheasant Aircraft Corporation of Fond du Lac, Wis., will locate its activities in Pawtucket, R. I., according to company officials. The consolidation will use the plant of the Eastern Aircraft Co., which was absorbed by the Dayton firm in Sept., 1929.

The U. S. Tool & Manufacturing Co., Detroit, has awarded a contract to the Austin Co. for the design and construction of a plant on Kingsley St. in Dearborn. The new plant will be a one and two-story steel frame structure for the manufacture of precision tools. The new project will be 100 ft. wide and 200 ft. long to be completed in 60 days.

The Cummings Car & Coach Co., Chicago, has entered into affiliation with the J. G. Brill Co., Philadelphia, Pa. Walter Cummings, president of the Cummings company, has been named a vice-president and director of J. G. Brill and will be in charge of its western division, with headquarters in Chicago.

The contract for the design and construction of a new unit of the Continental Tool division has been awarded the Austin Co. by the Ex-Cell-O Aircraft & Tool Corporation, 5835 Martin Ave., Detroit. The new plant, of one-story steel frame construction, will be 53 ft. wide and 190 ft. long. The project represents a $150,000 investment.

The Hammer-Bray Co., Twenty-sixth Ave. and East Twelfth St., Oakland, Calif., is planning an enlarged plant. The present plant is to be sold, and the new factory erected on 102nd Ave.

Articles of incorporation have been filed with the secretary of state of Indiana by the Vonnegut Moulder Corporation of Indianapolis, formed to manufacture, construct, reconstruct, assemble, and deal in machines and machinery.

The recently organized New Palestine (Ohio) Tool & Die Co. has taken over the former plant of the New Tread Tire Co., which has been vacant for some time, and is installing equipment moved from Garfield, Ohio. H. R. Smail is president and general manager; James Garford, vice-president and chief engineer; and W. A. Shasteen, secretary and treasurer.

General Cable Corporation, 420 Lexington Ave., New York, N. Y., is consolidating all sales, manufacturing, and accounting activities which were previously carried on independently and in the name of the individual divisions. This includes some 12 divisions.

The National Foundry Co. and the Quality Stove & Range Co., affiliated firms, have completed arrangements for the purchase of the abandoned National Carbon Co. factory at Belleville, Ill. The Carbon plant comprises 22 buildings with about 100,000 sq.ft.

The Federal-Mogul Corporation, Detroit, has acquired the Muzzy-Lyons Co., and the Federal Bearing & Bushing Co., Detroit, merging them under its own firm name with headquarters in Detroit. The Watkins Manufacturing Co., Wichita, Kan., will also be acquired.

The Wisconsin Gear & Engineering Co., Milwaukee, has purchased the two-story building, 40x200 ft., of the R. J. Schwab & Sons Co., 251 Reed St., Milwaukee, which has moved its foundry and manufacturing plant to Cedar Grove, Wis., where it occupies the enlarged works of the Cedar Grove Stove Co. Another section of the Schwab plant has been purchased by the Howard Brass & Copper Manufacturing Co., formerly at 407 Grove St.

The Teletype Corporation, Chicago, has been sold to the American Telephone & Telegraph Co., New York City, and will be operated as a subsidiary of the Western Electric Co., Chicago.

The Western Steel & Equipment Corporation has been formed at Portland, Ore., to handle iron, steel and general equipment for logging firms, railroads, industrial plants. Offices are maintained at 717 Lewis Bldg.

The Independent Pneumatic Tool Co., 600 West Jackson Blvd., Chicago, has appointed the Mine & Smelter Supply Co., Salt Lake City, Utah, as agent. This company will handle the complete line of *Thor* tools in this territory, and also has branch offices in Denver, Colorado, and El Paso, Texas.

PERSONALS

Clifford S. Stilwell has been appointed sales manager of the Warner & Swasey Co. with headquarters at the home office in Cleveland. Mr. Stilwell has been associated with the company since his

graduation from Denison University in 1912 when he began as special apprentice in the works at Cleveland. Following two years as representative in the Chicago and Detroit offices he was made district manager in Detroit in 1915. He assumed his new duties Oct. 1.

George H. Aupperl, for the past two years consulting metallurgist for the Tobatta Foundry Co., Tokyo, Japan, has returned to this country. Mr. Aupperl was for a number of years with the National Roll & Foundry Co.

Henry Brewer, vice-president and secretary, and Leslie H. Thompson, vice-president and treasurer, of the Winchester Repeating Arms Co., New Haven, Conn., have resigned. Mr. Brewer was placed on the retirement roll after 35 years' service, and Mr. Thompson continues as a member of the board. Edward Pugsley, factory superintendent, and Clifford R. Babson, sales director, become vice-presidents. A new vice-presidency was created and Thomas C. Johnson, production engineer, was elected to fill it. Richard D. Jack, comptroller, was elected treasurer, and Arthur E. Hodgson, assistant secretary, was made secretary.

B. F. Baker, president of the Kewanee (Ill.) Boiler Corporation, has announced the retirement of Dan B. Moore, for several years plant superin-

tendent, because of his failing health, and the appointment of Roy Powers, as new superintendent. Richard Krumtinger has been named assistant superintendent. Roy W. Houser, who has been in the Indianapolis office, has returned to the general office staff at Kewanee. Mr. Baker also announced the resignation of Harry D. Cherry, for 46 years an employee, and for the past eight years secretary.

E. T. Bennington, manager of the Cleveland Tramrail Division of the Cleveland Crane Engineering Co., Wickliffe, Ohio, will speak on "Material Handling in the Foundry" at a joint meeting of the Materials Handling Division, A.S.M.E., and the Newark (N. J.) Foundrymen's Association.

J. J. Burke, for many years head of the Burke Machinery Co., Portland, Ore., has resigned from active control to devote his attention to the development of a log-carrying barge.

J. A. Callahan, formerly factory manager of the Curtiss Aeroplane & Motor Co., Inc., Buffalo, N. Y., has joined the Briggs Manufacturing Co., Detroit.

W. R. Judson, for 13 years representative of the Allis-Chalmers Manufacturing Co., Milwaukee, in Chile, has been appointed managing director of Allis-Chalmers (France), the controlling office of that concern for all of Europe and northern Africa. He will leave Milwaukee on Oct. 15 for Paris to assume his new duties.

Charles A. Lynch, formerly manager of sales and engineering of the Fort Pitt Steel Casting Co., McKeesport, Pa., has been appointed vice-president and general manager of the Foote Co., Inc., Nunda, N. Y. Mr. Lynch has been identified with the steel casting industry for 23 years, the past 11 with the Fort Pitt Co.

Warren Maxwell has been appointed superintendent of the Dodge Works of the Link-Belt Co., Indianapolis, Ind., to replace the late F. J. Oakes. Mr. Maxwell, who was born in Rockville, Ind., in 1899, and who is a graduate of the United States Naval Academy at Annapolis, joined the Link-Belt Co. in 1922, entering the sales department. In January, 1929, he was made assistant superintendent, from which position he has just been promoted.

Herbert A. May, vice-president and director of the Union Drawn Steel Co., Beaver Falls, Pa., has been elected a director of the Pittsburgh & West Virginia railroad.

Ray H. Morris, for the past three years district manager for Brace-Mueller-Huntley, Inc., of their Rochester, N. Y., office, resigned that position on Oct. 1 to join the sales staff of the Davenport Machine Tool Co., Inc., Rochester, N. Y. For the present, Mr. Morris' territory will include New York State, Southern New England, and Northern New Jersey.

R. A. Russell has become affiliated with the Rustless Iron Corporation of America, 122 E. 42nd St., New York City, as vice-president in charge of sales. Mr. Russell was formerly with the Continental Can Co., and later organized and controlled the Paragon Can & Cap Co., Paterson, N. J. When the latter company was merged with the Anchor Cap Corporation in Long Island City, New York, Mr. Russell became vice-president of the Anchor organization.

J. Ralph Patterson, formerly manager of Adamite and alloy sales for the Mackintosh-Hemphill Co., Pittsburgh, has been elected manager of roll and alloy sales, combining these two departments following the resignation of Fred Griffith, formerly manager of roll sales.

C. J. Scullin of the Mississippi Valley Research Laboratories, St. Louis, Mo., spoke on "Advancement and Progress in the Gray Iron Industry" at the first fall meeting of the Philadelphia Foundrymen's Association on Oct. 8.

Martin Van Stappen has been appointed sales manager of the industrial blower and turbine department, Coppus Engineering Corporation, Worcester, Mass.

G. S. von Heydokampf has been appointed research engineer for the Southwark Foundry & Machine Co., Philadelphia. He has been engineer of tests for the Babcock & Wilcox Co., Bayonne, N. J., since his arrival about four months ago from Brunswick, Germany, where he was assistant instructor in the city technical high school.

H. F. Weatherby, formerly secretary of the Hallidie Machinery Co., Seattle, has retired from that firm and purchased a half interest in Buckner-Woodard Co., 1743 First Ave., South, Seattle. The firm name has been changed to Buckner-Weatherby Co., Mr. Weatherby holding the position of secretary, and having charge of the machine tool department.

OBITUARIES

Raymond G. Bullock, 45, vice-president and general manager of the Olean (N. Y.) Metal Cabinet Works, Inc., and formerly works manager of the Art Metal Construction Co., Jamestown, N. Y., died suddenly on Oct. 3 in Baltimore.

William D. Baldwin, 74, chairman of the board, Otis Elevator Co., and for many years president, died Sept. 26 at his home in Yorktown Heights, N. Y.

Bradford T. Borden, 50, formerly president of the Borden Machine & Tool Co., Warren, Ohio, and later an inventor of Lakewood, Ohio, died unexpectedly in Cleveland on Sept. 26.

Henry Lindahl, 71, president of the Lindahl Foundry & Machine Co., Chicago, for many years, died on Sept. 30 of heart disease.

Daniel Guggenheim, 74, of Guggenheim Bros., and for 20 years president of the American Smelting & Refining Co., died on Sept. 28 at his country home in Port Washington, L. I.

Samuel C. McCutcheon, 60, treasurer and assistant secretary of the North & Judd Manufacturing Co., New Britain, Conn., died suddenly Sept. 24 while visiting in Quebec.

Andrew Moore, 76, one of the founders of the Moore Shipbuilding Co., and president until his retirement at the close of the World War, died in Berkeley, Calif., Sept. 24.

Edwin P. Moritz, 57, mechanical engineer, died at his home in Scarsdale, N. Y., on Sept. 29. Until a year ago he had been with the International Combustion Engineers, New York, N. Y.

Erastus R. Simpson, 59, mechanical engineer, died in Boston on Sept. 23.

FORTHCOMING MEETINGS

AMERICAN SOCIETY OF MECHANICAL ENGINEERS—Calvin W. Rice, executive secretary, Engineering Societies Bldg., 29 West 39th St., New York, N. Y. The following meetings are scheduled:

French Lick Meeting, French Lick Springs Hotel, French Lick, Ind., Oct. 13-15.

Fifty-first annual meeting, Engineering Societies Bldg., Dec. 1-5.

Semi-Annual meeting, Birmingham, Ala., Apr. 20-23, 1931.

National Materials Handling Meeting and Management congress, Cleveland, Ohio, Apr., 1931.

National Aeronautic Meeting, Baltimore, Md., May, 1931.

NATIONAL MACHINE TOOL BUILDERS' ASSOCIATION—29th Annual Convention, Hotel Aspinwall, Lenox, Mass., October 13-15. Ernest F. DuBrul, 1415 Enquirer Bldg., 617 Vine St., Cincinnati, Ohio, is general manager.

SOCIETY OF INDUSTRIAL ENGINEERS—17th National Convention, Mayflower Hotel, Washington, D. C., Oct. 15-17. George C. Dent, 1815 Engineering Bldg., 205 W. Wacker Drive, Chicago, executive secretary.

STEEL FOUNDERS' SOCIETY OF AMERICA—October meeting at Pennsylvania Hotel, New York City, on Oct. 23, the day preceding the New York meeting of the American Iron & Steel Institute. G. P. Rogers, 932 Graybar Bld., New York City, is managing director.

NINTH NATIONAL EXPOSITION OF POWER AND MECHANICAL ENGINEERING—In Grand Central Palace, New York City, Dec. 1-6. Charles F. Roth, manager, Grand Central Palace.

WESTERN METAL CONGRESS AND EXPOSITION—Second National, Civic Auditorium, San Francisco, Calif., Feb. 16-20, 1931. Under auspices of A.S.S.T. W. H. Eisenman, secretary, 7016 Euclid Ave., Cleveland, Ohio.

THE INDUSTRIAL REVIEW

Weekly progress of the machinery and machine-tool business

DETROIT

There is a definite upward trend in the reports of the machinery and machine-tool trade in the Detroit area for the past ten days. While the improvement is not general and is not large, it is considered significant.

A number of representative dealers have received substantially larger orders during the past ten days than they had been receiving up until that time. Inquiries are increasing in number and in importance and there is a much better feeling all along the line. One dealer said his sales for the past month are 40 per cent or even greater than during August. A number of other dealers report sales considerably in excess of July and August, and nearly all of them indicate that the number and the type of inquiries now being received from automobile and accessory manufacturers presages a revival of business during the next six months.

The atmosphere is considerably better and this is reflected in many ways. One large body builder has sent out a very important inquiry.

BUFFALO

In the last report signs of optimism were noted and an upturn in business was predicted. While the upturn is still nothing to shout about, the optimistic trend is still greater than a fortnight ago. Optimism may now be fairly termed as more pronounced than at any time in the last nine months.

This is true of machine-tool dealers and of electrical equipment dealers and manufacturers' representatives. Inquiries have shown a considerable increase. While the amount of business closed has shown little or no increase in most offices as yet, it is confidently expected that some of the inquiries will certainly result in business.

Another good feature of the situation seems to be the wide diversification of demand. It is reported that the Pierce Arrow Motor Car Company is going at a good rate of production. Those who supply contractors' equipment are not so optimistic. They do not look for an improvement in their line for a time.

SAN FRANCISCO

Based on the manner in which the machine-tool business has kept up during the summer months in this territory and on the volume of inquiries and anticipated orders at this time, the outlook for fall business is good.

Roadmaking machinery has continued to be in demand as is ditch-digging machinery and similar equipment. Significant of the changing times is the comparatively small amount of equipment to be found on the floors of the machine-tool houses in San Francisco. This is the result, not of a decrease in sales, but of the short period of time consumed in moving freight from the manufacturing centers of the East to the Pacific Coast.

CINCINNATI

Most machine-tool manufacturers reported business a shade better in September. In the past week the business picture may be likened to a slow-motion projection, devoid of features. There were a few slight increases in sales, but these are attributed to "lucky breaks" rather than to any upward market trend.

Selling agents found the market about the same. The greater part of the week's business was for single tools, placed by general machinists and miscellaneous users. Sales were well diversified and well scattered over the different sections of the country. A number of inquiries came in.

■

SALES and inquiries are acquiring enough force at last to free the ship of business from the shoals where she has been bumping bottom for so long. Though neither has achieved such strength as to make a radical change in the sales curve, the change of opinion substantiated by increasing numbers of orders is at least noticeable. Detroit predicts a definite improvement within the coming six months as a result of increasing automotive inquiries and a better total of orders. Buffalo inquiries have also shown a decided increase, and orders received have created more optimism than has been evident for the past nine months. On the West Coast, San Francisco considers the outlook good.

CINCINNATI manufacturers consider September business a shade better, with few features in the situation and sales increases attributed to "lucky breaks." Selling agents there report a featureless market also, with increasing inquiries. Philadelphia manufacturers have some good orders, with others which are expected soon, one producer having inquiries for $100,000 worth of tools. Cleveland's market is spotty, expressions ranging from exceedingly good to painfully slow, most sales curves, however, showing an upward turn.

NEW ENGLAND electrical manufacturers are making steady progress, with public utility and foreign buying leading the march. New York's market is coming along, though still straggling, sales of the past week being principally for single tools. Chicago inquiries are assuming a more satisfactory character, with industrial lists expected soon. *American Machinist* has published descriptions of some 300 new tools since July 1, a figure about 130 per cent of normal.

PHILADELPHIA

The traveler through the desert of depression encountered an occasional oasis as he journeyed through Philadelphia during the last two weeks. One manufacturer of leather belting and other equipment reported there were some rather substantial orders for industrial plants which came from the South and the West. Business at that plant in September was better than in July and August, and indications are that there will be more improvement.

Another bright spot was a report that the Rayon Company is anticipating the purchase of equipment. Some inquiries have come also from other industrial lines.

During the fortnight, inquiries for machinery and machine tools totaling about $100,000 reached another producer, who said he believes there will be some closing of orders within the next six weeks.

CLEVELAND

Spottiness characterizes the local machine-tool market. Expressions range from exceedingly good to painfully slow. Recipients of good business two weeks ago report low spots in the past week and vice versa. Sales closed included purchases from bus body, rubber mold, tractor, and automobile parts manufacturers. Sales charts for September generally showed an upward trend.

Inquiries are showing better activity. This prospective business, although encouraging in its scope, is viewed by some as more of a preparedness program with actual sales in the offing. Inquiries show a preference for first-class used tools, indicating price as the consideration. Bids for four toolroom lathes will be received by the Board of Education on Oct. 20.

NEW ENGLAND

Improvement in the New England machine-tool field is not in the form of orders. Inquiry holds up well, but the situation has not yet assumed the rosy aspect long anticipated. October, to the contrary, finds the trade still optimistic but very much in doubt regarding the start of the "Big Parade."

Reports of industrial improvement in various lines of endeavor are current. Some of these prove to be of short duration and tend to accentuate the uncertainty of the situation. Steady improvement in several lines of electrical manufacturing, especially clock and radio makers, is a gratifying feature. Public utilities are good business builders and with construction contracts show fall progress to keep the barometer of expectation on the upgrade.

Foreign markets are the chief source of sales. Domestic buyers are pursuing a hand-to-mouth policy and distributors of used equipment are well stocked, with few sales being reported. The Boston & Maine Railroad indicates machine equipment purchases for its Concord, N. H., shops.

NEW YORK

Though still straggling like boys on their way to school, inquiries and orders are coming along. Few sales for more than a single tool have been reported, American Locomotive's $70,000 list and that of the Robbins Drydock for a 40-in. lathe and two horizontal boring machines for the Todd Shipyard, totalling $50,000, now being complete, as is that for Westinghouse at Newark. Other buying is general in nature, indicating convalescence. Inquiries include one for two lathes from a copper company, and several from shipyards and other transportation industries. One dealer, anticipating the upturn, has added a salesman, and another reported a September 100 per cent better than any of the past few months. Optimism is general, for prospects with year-old moths imprisoned in their pocketbooks are paying attention at last.

CHICAGO

Continued dullness is reported in the machine-tool industry. Here and there a slight improvement in sales by a few concerns indicates bright spots. Inquiries are received in good volume and are of a more satisfactory character with respect to closing prospects. No new lists are noted, but there are said to be one or more substantial ones from industrial sources soon. A limited canvass of the machinery trade, reveals some, though not general, optimism, the consensus of opinion being that for the remainder of the present year there will be no marked improvement in conditions unless there should occur a decided and widespread resumption of industrial activity throughout the country.

BUSINESS • BAROMETER

The situation seems to be mending and the small minority of optimists are encouraged

THEODORE H. PRICE
Editor, Commerce and Finance, New York

IN ENGLAND there is a firm of Anglo-Oriental bankers that was established about 150 years ago. It has been continuously successful, and its present proprietors claim that its prosperity has been a result of the observance of certain rules laid down by its founders. One of these rules inhibits the issuance of a profit and loss account more than once in ten years; and another provides that none of the partners shall draw more than 50 per cent of his share of the decennial profits unless his interest in the firm is ended by death or by retirement.

Memoranda left by those who adopted these rules explain that their experience indicated that at least a decade was required in order to test the wisdom of any business policy, and that thrift was not encouraged by allowing the partners to withdraw all the profits accruing to them prior to death or retirement.

The policy described and its results are well worth the attention of American business men at present. It is less than a year since most of the American markets were booming and high authorities were proclaiming that there was no end to our prosperity, although a study of any ten-year period would have convinced an open-minded man that all booms have an end, and that no period of depression lasts indefinitely.

The rise in prices that ended in November, 1929, had been in progress nearly four years. It was terminated by an abrupt and panicky decline that still depresses the many who forget that the law of average is immutable in its operations, and that conclusions drawn from short periods may be highly misleading.

Therefore, it is well to remember that the recurrent business depressions from which we suffer tend to grow shorter and to cause less shock. But neither booms nor depressions are to be measured by the calendar year. The upward movement which ended about a year ago had been in progress since 1924, and it is not to be expected that it could be completely liquidated in a few months as some supposed it might be. It is, however, gratifying to observe that the markets decline less easily than they did when the liquidation started, and that some of them are commencing to show a resiliency that is highly encouraging to the few optimists that have been able to resist the contagion of pessimism that seems so widespread.

The decline registered last week on the Stock Exchange appears to have been largely the work of professionals. In the bond market the tendency was upward, and the demand for interest-bearing obligations seems likely to persist as long as call money is to be had at from 2 to 2½ per cent. But the developments of the week in the commodity markets have not been so cheerful. Many staples have declined and some of them have sold at the lowest prices ever touched.

Toward the end of the week there was some recovery from the demoralization, but the timidity of the public was reflected by the hesitancy in evidence among those who would ordinarily be bold buyers at the low prices which now prevail. The pessimism felt is in fact so general that it is hardly necessary to discuss details. The whole nation, if not the entire business world, seems to be having an attack of melancholia for which there is no justification.

For this reason it may be well to point out that the history of the markets shows that those who buy in moments of depression like the present do not often fail to make money, and that they perform a public service by using their capital in support of the values whose psychological effect is so important. Even in times of famine or complete crop failure it never has been possible to figure out an actual deficiency or a minus supply. Conversely, it has been equally impossible to depress prices below zero despite record-breaking supplies. Something always happens to disprove the calculations of the extremists, and it is upon this unpredictable certainty that we must rely in moments like the present when everyone who has a lead pencil is able to prove that the surplus of essential products is so large that it cannot be consumed, and that next year's crops will come upon markets that are already saturated by this year's super-abundance.

It may be urged that this is a generalization. This is true, but generalizations that are drawn from human experience over a reasonable length of time are very dependable rules of conduct. Those who comply with them are not likely to suffer very keenly.

Meanwhile, it is gratifying to note a more encouraging outlook in some directions. The cotton-textile industry in both this country and Europe seems to be improving. The Orient is still distraught over the military situation in China and the political unsettlement which prevails in India. It is, however, hard to obtain reliable news.

Taken all in all, the situation seems to be mending, and the small minority of optimists are accordingly encouraged.

THE BUSINESS WEEK

October 8, 1930

AFTER a last frantic attempt this week to sell the world back to the cave-men on the basis of a sheriff's auction, the bears in the commodity and security markets were routed by a revulsion to common-sense on the part of the business community. There has been a somewhat sheepish realization that though the high and justifiable hope of vigorous business recovery this fall seems to have gone glimmering, it does not follow that the world is going back to bows and arrows, buggies, cave-bungalows, and bear-skins. Though still disappointing in its speed, gradual improvement in the general level of business activity continues, at slightly more than the seasonal rate. Our preliminary index for the week ended Sept. 27 shows a further slow rise from 85.8% of normal to 86%. The seasonal rise in industrial activity is still irregular and uncertain, but in general trade and in building it is more definite. Further improvement during October is fairly certain, but, without a sudden and decisive change in business psychology and banking policy, it is difficult to see from what source to expect trade to gather sufficient momentum in the next six weeks to carry us through the winter onto higher and firmer ground next year. The economic aborigines and puritan fathers who like long winters will enjoy this one.

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THE WEEKLY PRICE GUIDE . . . .

Rise and Fall of the Market

SHIPMENTS of steel pipe from midwestern mills now are at record high levels. Other branches of the steel trade, however, continue slow with no perceptible signs of early recovery. The market for iron also is depressed. Rail buying, for one thing, appears to be remarkably dull for early autumn. In general, there was an increase in steel buying during September, thought to be due to low stocks at warehouses. Subsequent replenishment evidently has stemmed the buying spurt. Another unfavorable sign is seen in the drop, this week, in steel scrap. Heavy melt is down 50c. per ton, Pittsburgh, in contrast with the rising trend of a month ago. Copper prices are lowest since 1896. Principal declines of the week occurred in prices of lead, zinc, copper and brass wire, solder, linseed oil and scrap nonferrous metals. There were no advances in materials listed here.

(*All prices as of Oct. 3, 1930*)

IRON AND STEEL

PIG IRON—Per gross ton, f.o.b.:

CINCINNATI	
No. 2 Southern (silicon 1.75@2.25)	$16.69@$18.19
Northern Basic	19.89@ 20.39
Southern Ohio No. 2	19.89@ 20.39
NEW YORK—Tidewater Delivery	
No. 2 Southern (silicon 1.75@2.25)	18.00@ 18.50
BIRMINGHAM	
No. 2 Foundry (silicon 1.75@2.25)	14.00
PHILADELPHIA	
Eastern Pa., No. 2x (silicon 2.25@2.75)	20.00
Virginia No. 2	18.75@ 19.25
Basic	22.29
CHICAGO	
No. 2 Foundry, local (silicon 1.75@2.25)	19.00
No. 2 Foundry, Southern (silicon 1.75@2.25)	18.20
PITTSBURGH, including freight charge ($1.76) from Valley:	
No. 2 Foundry	19.63@ 20.13
Basic	19.63@ 20.13
Bessemer	20.76

IRON MACHINERY CASTINGS—Cost in cents per lb. of 100 flywheels, 6-in. face x 24-in. dia., hub not cored, good quality gray iron, weight 275 lb.:

Detroit	4.00
Cleveland	4.75
Cincinnati	4.45
New York	4 75@5.00
Chicago	4.50@4.75

SHEETS—Quotations are in cents per pound in various cities from warehouse; also the mill base in large lots:

Blue Annealed*	Pittsburgh Mill Base	Chicago	Cleveland	New York
No. 10	1.90@2.00	3.35†	3.00	3.40†
No. 12	1.95@2.05	3.45†	3.10	3.45†
No. 14	2.05@2.15	3.55†	3.20	3.50†
No. 16	2.15@2.25	3.65†	3.30	3.60†
Black				
Nos. 18 to 20	2.25	3.60†	3.40	3.70
No. 22	2.40	3.75†	3.55	3.85
No. 24	2.45	3.80†	3.60	3.90
No. 26	2.55	3.90†	3.70	4.00
No. 28	2.70	4.05†	3.85	4.15
Galvanized				
No. 10	2.30@2.40	3.65†	3.65	3.55
Nos. 12 to 14	2.40@2.50	3.75†	3.75	3.65
No. 16	2.50@2.60	3.85†	3.85	3.75
No. 18	2.65@2.75	4.00†	4.00	3.90
No. 20	2.80@2.90	4.15†	4.15	4.05
No. 22	2.85@2.95	4.20†	4.20	4.10
No. 24	3.00@3.10	4.35†	4.35	4.25
No. 26	3.25@3.35	4.60†	4.60	4.50
No. 28	3.50@3.60	4.85†	4.85	4.75

*Light Plates. †400 to 3,999 lb.

WELDED STEEL PIPE—Warehouse discounts are as follows:

	New York		Cleveland		Chicago	
	Black	Galv.	Black	Galv.	Black	Galv.
1 to 3 in. butt	56.14%	43.6%	53.3%	42.3%	57.3%	44.8%
3½ to 6 in. lap	52.72%	40.18%	50.8%	37.8%	53.9%	41.4%

WROUGHT-STEEL PIPE LIST

Size, Inches	List Price per Foot	Diameter in Inches—External	Diameter in Inches—Internal	Thickness Inches
1	$0.17	1.315	1.049	.133
1¼	.23	1.66	1.38	.14
1½	.27½	1.9	1.61	.145
2	.37	2.375	2.067	.154
2½	.58½	2.875	2.469	.203
3	.76½	3.5	3.068	.216
3½	.92	4.0	3.548	.226
4	1.09	4.5	4.026	.237
5	1.48	5.563	5.047	.258
6	1.92	6.625	6.065	.28
8	2.50	8.625	8.071	.277

SEAMLESS STEEL TUBING—Following net prices are for seamless mechanical tubing, cold drawn, round, .10 to .30 carbon, at New York warehouse in lots of less than 100 ft. or 100 lb.:

Thickness—Decimal	B.w.g. and Fractions	Outside Diameter in Inches—Price per Foot: ⅛	¼	⅜	½	⅝	1	1⅛	1¼
.035″	20	$0.15	$0.16	$0.17	$0.18	$0.19	$0.21	$0.23	
.049″	18	.17	.18	.19	.20	.21	.23	.25	
.065″	16	.19	.20	.21	.22	.23	.25	.27	
.083″	14	.20	.22	.23	.24	.25	.27	.29	
.095″	13	.21	.23	.25	.26	.27	.29	.31	
.109″	12	.22	.24	.26	.27	.28	.30	.32	
.120″ or .125″	11	.23	.25	.27	.28	.29	.31	.33	
.134″	10	.24	.26	.28	.29	.30	.32	.34	

MISCELLANEOUS—Warehouse base prices in cents per lb.:

	New York	Cleveland	Chicago
Spring steel, light*	4.50	4.65	4.65
Spring steel, heavier	4.00	4.00	4.00
Coppered Bessemer rods	7.00	6.00	6.15
Hoop steel	3.75†	4.00	3.75†
Cold rolled strip steel	4.95	6.00	6.10
Floor plates	4.85†	5.30	5.00†
Cold fin., round or hexagon‡	3.40	3.65	3.35
Cold fin,, flat or square‡	3.90	4.15	3.85
Structural shapes	3.10†	3.00	3.00†
Soft steel bars	3.10†	3.00	3.00†
Soft steel bar shapes	3.10†	3.00	3.00†
Soft steel bands	3.40†	3.65	3.20†
Tank plates	3.10†	3.00	3.00†
Bar iron (2.75 at mill)	3.24	3.00	3.00
Drill rod (from list)	60%	55%	50%

*Flat, $\frac{3}{16}$-in. thick by ¼-in. wide. †400 to 3,999 lb., ordered and released for shipment at one time. ‡Cold finished steel, shafting and screw stock.

Electric welding wire at New York warehouse—$\frac{5}{32}$, 8.35c. per lb.; ⅛, 7.85c. per lb.; $\frac{5}{32}$ to ½, 7.35c. per lb.

METALS

Warehouse Delivery Prices in Cents Per Lb. for Small Lots:

Copper, electrolytic, New York			12.50
Tin, Straits, pigs, New York			32.00@33.00
Lead, pigs, E. St. Louis	5.20	New York	6.00@ 7.00
Zinc, slabs, E. St. Louis	4.22½	New York	6.25@ 7.25

	New York	Cleveland	Chicago
Antimony, slabs	10.00@10.50	11.00	10.75
Copper sheets*	20.25	20.50	20.50
Copper wire*	11.75	13.12½	13.12½
Copper, drawn, round*	18.75	19.00	19.00
Copper tubing*	22.50	22.75	22.75
Brass sheets, high*	17.37½	17.62½	17.62½
Brass tubing, high*	22.25	22.50	22.50
Brass rods, high*	15.62½	15.87½	15.87½
Brass wire, high*	17.50	18.12½	18.12½

*Mill, base.

SHOP MATERIALS AND SUPPLIES

METALS—Continued

	New York	Cleveland	Chicago
Aluminum ingots, 99%†.....	24.25	24.30	23.30
Zinc sheets (casks).....	9.75@10.25	11.25	10.11
Solder (½ and ½).....	24.25	23.50	22@24

Babbitt metal, delivered in case lots, New York, cents per lb.:

Genuine, highest grade.....	50.00
Commercial genuine, intermediate grade.....	37.00
Anti-friction metal, general service.....	31.00
No. 4 babbitt, f.o.b.....	10.50

†F.O.B.

NICKEL AND MONEL METAL—Price in cents per lb., base, f.o.b. Huntington, W. Va.:

	Nickel	Monel Metal
Sheets, full finished.....	52.00	42.00
Sheets, cold rolled.....	60.00	50.00
Strip, cold rolled.....	55.00	45.00
Rods, hot rolled.....	45.00	35.00
Rods, cold drawn.....	50.00	40.00
Tubing.....	75.00*	90.00†
Angles, hot rolled.....	50.00	40.00
Plates.....	52.00	42.00

*Seamless. †Welded.

OLD METALS—Dealers' purchasing prices in cents per pound, f.o.b. cars:

	New York	Cleveland	Chicago
Crucible copper.....	8.25 @8.50	8.75	8.00@ 8.50
Copper, heavy, and wire..	8.00 @8.25	8.25	7.50@ 8.00
Copper, light, and bottoms	7.00 @7.50	7.25	6.75@ 7.25
Heavy lead.....	4.25 @4.37½	4.00	3.25@ 3.75
Tea lead.....	2.00 @2.25	2.50	2.25@ 2.75
Brass, heavy, yellow.....	5.00 @5.25	4.75	4.50@ 5.00
Brass, heavy, red.....	7.25 @7.50	8.00	6.75@ 7.25
Brass, light.....	4.00 @4.25	3.75	4.00@ 4.50
No. 1 rod-brass turnings.	5.25 @5.50	5.25	4.50@ 5.00
Zinc.....	2.00 @2.25	1.50	1.50@ 1.75

TIN PLATES—Charcoal—Bright—Per box:

"AAA" Grade:	New York	Cleveland	Chicago
IC, 14x20.....	$12.10	$11.95	$11.50
"A" Grade:			
IC, 14x20.....	9.70	9.90	9.50
Coke Plates—Primes—Per box:			
100-lb., 14x20.....	6.45	6.10	7.00
Terne Plates—8-lb. Coating—Small lots—Per box:			
IC, 14x20.....	7.75@8.00	7.00	7.50

MISCELLANEOUS

	New York	Cleveland	Chicago
Cotton waste, white, per lb.....	$0.13	$0.16	$0.15
Cotton waste, colored, per lb...	.09½	.12	.10
Wiping cloths, washed, white, per lb.....	.14	38.00 per M	.14½
Sal soda, per lb.....	.01½	.02	.02
Roll sulphur, per lb.....	.028	.03½	.04
Linseed oil, raw, in 1 to 4 bbl. lots, per lb.....	.104	.141	.11
Cutting oil, about 25% lard, in 5 gal. cans, per gal.....	.65	.60	.60
Machine oil, medium-bodied (55 gal. steel bbl.) per gal.....	.33	.36	.24
Belting—Present discounts from list in fair quantities (½ doz. rolls) for leather or rubber:			
Leather—List price, 24c. per lin.ft., per inch of width, for single ply:			
Medium grade.....	30–10%	30–10%	35%
Med. grade, heavy wgt.....	30%	30 –5%	30%
Rubber transmission, 6-in., 6 ply, $1.83 per lin.ft.:			
First grade.....	50%	50–10%	50%
Second grade.....	60%	60– 5%	50–10%

Comparative Warehouse Prices

New York	Unit	Current Price	Four Weeks Ago	One Year Ago
Soft steel bars.....	per lb.	$0.031	$0.031	$0.033
Cold fin. shafting.....	per lb.	.034	.034	.036
Brass rods.....	per lb.	.1562½	.1612½	.2125
Solder (½ and ½).....	per lb.	.2425	.245	.33
Cotton waste, white..	per lb.	.13	.13	.10@.13½
Disks, aluminum oxide mineral, cloth, No. 1 6-in. dia.....	per 100	4.59	4.59	3.60
Lard cutting oil.....	per gal.	.65	.65	.75
Machine oil.....	per gal.	.33	.33	.33
Belting, leather, medium.....	off list	30–10%	30–10%	30–10%
Machine bolts, up to 1x30 in., full kegs....	off list	65%*	65%*	50–10%*

*List prices as of April 1, 1927

MISCELLANEOUS—Continued

	New York	Cleveland	Chicago
Abrasive materials — Standard grade, in sheets 9x11 in., No. 1, per ream of 480 sheets:			
Flint paper*.....	$6.03	$6.03	$6.03
Emery cloth*.....	25.87	25.87	25.87
Disks, aluminum oxide mineral, 6 in. dia., No. 1, per 100:			
Paper†.....	2.61	2.61	2.61
Cloth†.....	4.59	4.59	4.59
Fire clay, per 100 lb. bag.....	1.00	.75	.75
Coke, prompt furnace, per net ton....	Connellsville,		2.60
Coke, prompt foundry, per net ton....	Connellsville,		3.50@4.85
White lead, dry.....	100 lb. kegs...	New York,	13.75
White lead, in oil.....	100 lb. kegs...	New York,	13.75
Red lead, dry.....	100 lb. kegs...	New York,	13.75
Red lead, in oil.....	100 lb. kegs...	New York,	15.25

*Less than 3 reams. †Less than 200.

SHOP SUPPLIES

Discounts from new list dated Apr. 1, 1927, applying on immediate deliveries from warehouse stocks in New York and vicinity:

Machine bolts:	
Up to ¾-in. x 6-in., full kegs, list less.....	65%
Larger, up to 1 x 30-in., full kegs, list less.....	65%
Less than full kegs or case lots, add to list.....	10%
Fitting-up bolts: list less.....	45%
Lag screws:	
Up to ½-in. x 6-in., list less.....	65%
Larger, list less.....	65%
Less than full keg or case lots, add to list.....	10%
Rivets:	
Structural, round head, full kegs, net.....	$4.50
Structural, round head, broken kegs, net.....	6.00
Tank, 7/16-in. dia. and smaller, list less.....	65%
Nuts:	
Hot pressed, square or hexagonal, blank or tapped:	
Full kegs up to 1-in., incl., list less.....	65%
Larger, up to 3-in., list less.....	65%
Less than keg or case lots, add to list.....	10%
Washers:	
Wrought, full kegs, per 100 lb., list less.....	$4.00
Wrought, broken kegs, per 100 lb., list less.....	2.00
Turnbuckles:	
With stub ends, list less.....	20–10%
Without stub ends, list less.....	55%
Chain:	
Proof coil, base, per 100 lb., net.....	$8.50
Cast iron welding flux, per lb., net.....	.35
Bronzing flux, per lb., net.....	.50

MACHINE REQUIREMENTS AND INDUSTRIAL CONSTRUCTION

Equipment Wanted

D. C., Washington—A. L. Flint, General Purchasing Officer of the Panama Canal—will receive bids until Oct. 14 for pipe dies, drills, expansion bits, ship augers, pipe cutters, etc., also until Oct 15 for grinding machine, etc.

Mass., Newton (Boston P. O.)—**G. D. R.**, 10-A Pearl St.—sheet metal machines, power pipe threader and bench tools.

Mass., Roxbury (Boston P. O.)—Dept. of School Buildings, 11 Beacon St., **L. J. Rourke**, Supt., Boston—will receive bids **until Oct. 14** for woodworking machinery for **Boston Trade** School here.

O., Dayton—Mitchell Spring **Service Co.**, 427 East Third St.—complete equipment for spring and auto repair shop.

Pa., St. Marys—Spear **Carbon Co.**—3 ton electric crane for proposed 1 story, **82 x 119** ft. carbon plant.

Opportunities for Future Business

Ala., Birmingham—Crane Co., 2 South **20th** St., awarded contract for the construction of a 2 story, 140 x 200 ft. foundry and machine shop. Estimated cost $110,000.

Calif., Los Angeles—Goodyear Tire & Rubber Co., 6701 South Central Ave., is having plans prepared for a 2 story, 64 x 172 ft. tire service building at 1401-03 East 9th St. Estimated cost $40,000. C. Beelman, 1019 Union Bank Bldg., Archt.

Calif., Oakland — Hammer Bray Co., 26th Ave. and East 12th St., is having preliminary plans prepared for the construction of a factory for the manufacture of stoves, etc., on 102nd Ave. Estimated cost $200,000. C. N. Burrell, American Bldg., Archt.

Conn., Danbury—Concannon Shear **Co.**, is having plans prepared for a 2 story, 40 x 150 ft. factory. Estimated cost $45,000. Private plans.

Conn., Meriden—Industrial School, R. L. McLaughlin, Supt., plans the construction of a work shop. Estimated cost $45,000. Architect not selected.

Conn., New Britain—Vulcan Iron Works, 63 John St., is receiving bids for a 1 story, 70 x 175 ft. factory on John St. Estimated cost $50,000. M. J. Unkelbach, 52 Main St., Archt.

Ind., Evansville—Servel Inc., 19 Morton St., awarded contract for the construction of a factory for the manufacture of gas refrigerators. Estimated cost $100,000. Noted Jan. 23.

Ind., Fort Wayne—A. Tilden, will build a machine shop and service station at Woodland and Calhoun Sts. Estimated cost $40,000. Larimore & Parkinson, Archts. Work will be done by owner's forces.

Ind., Fort Wayne—A. M. Zuber, 2801 New Haven St., will build a super service station at Pontiac and Anthony Sts., Estimated cost $40,000. Private plans. Work will be done by owner's forces.

Ind., Indianapolis—C. F. Gregg, Market and West Sts., awarded contract for the construction of a super service station. Estimated cost $40,000.

Mass., Fall River—Pocasset Realty Corp., E. Hurst, c/o Pocasset Mfg. Co., is having revised plans prepared for the construction of a 2 story garage and stores building on C St. Estimated cost to exceed $40,000. E. M. Corbett, 49 Purchase St., Archt. Noted Dec. 19, 1929.

Mass., Pittsfield—General Electric Co., E. A. Wagner, Gen. Mgr., is having plans prepared for a 1 story, 150 x 550 ft. transformer tank shop on Tyler Ave. Estimated cost to exceed $40,000. Private plans.

Mass., Holyoke—Bd. of Public Works, City Hall, will receive bids about Oct. 15, for the construction of a 3 story, 150 x 235 ft. vocational school on Beech St. Estimated cost $40,000. G. P. B. Alderman Co., 316 High St., Archts. Noted June 26.

Mass., South Boston (Boston P. O.)—Greyhound Garage, c/o Eisenberg & Feer, 11 Beacon St., Boston, Archts., is receiving bids for the construction of a 1 story repair and service garage at 571-583 First St., here. Estimated cost $40,000.

Mass., Springfield—Street Dept., City Hall, will receive bids until Oct. 16 for the construction of a 2 story service shop and storage unit on Taylor St. Estimated cost $50,000. McClinock & Craig, 458 Bridge St., Archts. Noted July 31.

Mass., Worcester—Dpt. of Public Buildings, plans the construction of a trade school on Grove St. Estimated cost $125,000 to $150,000. Architect not selected.

Mich., Dearborn — U. S. Tool & Mfg. Co., Detroit, awarded contract for the design and construction of a 2 story, 100 x 200 ft. factory for the manufacture of precision tools on Kingsley St., here.

Mich., Detroit — Ex-Cell-O Aircraft & Tool Corp., 5835 Martin Ave., awarded contract for the design and construction of a 1 story, 53 x 190 ft. factory. Estimated cost $150,000.

N. J., Bound Brook—G. A. Just Co., 395 Lexington Ave., New York, N. Y., will build a steel fabrication plant here. Estimated cost $40,000. Architect not selected. Work will be done by separate contracts. Maturity 1932. Noted Aug. 28.

N. J., Maplewood—LeRoy Schenck, 513 Valley St., will not construct 2 story shop and garage. $40,000. Project in abeyance. Noted Oct. 2.

N. J., Newark—Bd. of Education, City Hall Annex, is having sketches made for a 3 story repair department building. Estimated cost $150,000. Architect not announced. Noted Aug. 28.

N. Y., Brooklyn—Central Concrete Mixing Co., A. Clarke, Pres., 572 Smith St., plans the construction of a 67 x 105 ft. service garage at King and Dwight Sts. Estimated cost to exceed $40,000. P. Freshman, 50 Court St., Archt. Noted Sept. 11. Maturity about Jan. 1.

N. Y., Brooklyn—O. Curth, Saratoga Ave. and Macon St., plans the construction of a 2 story service garage. Estimated cost $40,000. Allmendinger & Schlendorf, 1 Hansen Pl., Archts. Maturity after Jan. 1. Noted Sept. 11.

N. Y., Brooklyn—J. A. Flanagan, 672 72nd St., plans the construction of a service garage at 73rd and 7th Ave. Estimated cost $75,000. F. H. Kie, 250 Park Ave., New York, Archt. Maturity about Jan. 1. Noted Aug. 1, 1929.

N. Y., Brooklyn—Fulton Criterion Co., Fulton St. and Grand Ave., plans the construction of a 2 story service garage. Estimated cost $75,000. H. M. Sushan, 367 Fulton St., Archt. Maturity about January. Noted Jan. 30.

N. Y., Brooklyn—N. Mastranda, 363 East 29th St., is having sketches made for a 100 x 110 ft. service garage at East 29th St. and Ave. D. Estimated cost to exceed $40,000. Lama & Proskauer, 391 Fulton St., Archts.

N. Y., Brooklyn—F. H. McLaughlin, 153 West 97th St., New York, postponed taking of bids until December for a service garage at Columbia and Creamer Sts. here. Estimated cost $60,000. J. F. McKenna, 58 Van Dyke St., Archt. Noted June 12.

N. Y., Brooklyn—M. H. Renken Dairy Co., 584 Myrtle Ave., awarded contract for the construction of a garage and shop at Classon and Myrtle Aves. Estimated cost $40,000. Noted Sept. 11.

N. Y., Brooklyn—J. Sholnik, 729 Ave. T, is having sketches made for the construction of a service garage at Adelphi St. and Atlantic Ave. Estimated cost $45,000. H. J. Nurick, 44 Court St., Archt.

N. Y., Brooklyn—J. Slessinger Co., 545 5th Ave., (light manufacturing) will build a factory. Work will be done by day labor and separate contracts.

N. Y., Buffalo—Ford Motor Co., 3674 Schaefer Rd., awarded contract for a 1 and 2 story, 400 x 1,000 ft. assembly plant including 60 x 90 ft. machine shop here. Estimated cost $750,000. Noted July 31.

N. Y., Brooklyn — Wheeler Holding Corp., 18th St. and Coney Island Creek, is having sketches made for the construction of a 120 x 245 ft. boat building plant and boat house at West 18th St. and Ave. Z. Estimated cost $45,000. H. E. Wheeler, 1540 Brooklyn Ave., Archt.

N. Y., Jamaica—Corp., c/o A. McLean, 149-27 Jamaica Ave., awarded contract for the construction of a 117 x 169 ft. service garage at Jamaica Ave. and Bellaire St. Estimated cost $40,000.

N. Y., Long Island City—Warner Quinlan Co., 2 Park Ave., New York, will receive bids in December for the construction of a service garage at Vernon Ave. and 13th St., here. Estimated cost $180,000. Also soon takes bids for a 2 story service garage at Vernon Ave. and 44th Rd., Richmond Hill. $45,000.

N. Y., Naponoch—Dept. of Correction, State Capitol, Albany, will soon receive bids for the construction of an industrial shop, etc. for State Institution of Defective Delinquents, here.

N. Y., New York—Consolidated Gas Co., 4 Irving Pl., will soon award contract for a 1 story, 62 x 201 ft. service garage at 415 East 110th St. Estimated cost $75,000. Private plans.

N. Y., New York—Gerosa Paladino Holding Corp., 266 East 137th St., will receive bids about Nov. 1 for the construction of 100 x 320 ft. garage service station, etc. at Webster Ave. and 182d St. Estimated cost $75,000. De Rosa & Cavalieri, 370 East 149th St., Archts. Noted May 8.

N. Y., New York—J. A. Kennedy Realty Co., 381 South St., will soon award contract for the construction of a service garage at 575 Water St. Estimated cost $40,000. A. Fisher, 1476 Broadway, Archt. Noted June 12.

N. Y., New York—R. Lowenthal, 1880 Grand Concourse, will receive bids early in spring for a 50 x 190 ft. service garage, etc. at Bailey Ave. and 230th St. Estimated cost $150,000. A. Slavin, 2690 University Ave., Archt. Noted Sept. 25.

N. Y., New York—M. M. Luedke, Hawthorne, N. Y., plans the construction of a service garage at 65 West 99th St., here. Estimated cost $70,000. C. Schaefer, Jr., 332 East 149th St., New York, Archt. Noted Sept. 25.

N. Y., New York—Henry Mandel Development Corp., plans the construction of an 8 story, 99 x 125 ft. service garage at 416 West 25th St. Estimated cost to exceed $150,000.

N. Y., New York—M. Michaelson, 539 West 47th St., is receiving bids for altering building into garage at 406 West 45th St. Estimated cost $60,000. L. Rogel, 367 Fulton St., Brooklyn, Archt. Noted Apr. 10.

N. Y., White Plains—Jasamore Realty Co., S. M. Salke, Pres., c/o Ellis & Ellis, Inc., plans the construction of a 3 story, 50 x 175 ft. service garage at 85 South Lexington Ave. Estimated cost to exceed $100,000.

O., Olmstead Falls—Schultz Motor Co., will build a 1 story, 50 x 63 ft. garage on Columbia Rd. Work will be done by separate contracts.

O., Wickliffe—Cleveland Crane & Engineering Co., H. Karr, Purch. Agt., awarded contract for a 1 story addition to factory. Estimated cost $40,000.

Pa., Oil City—National Transit Co., F. D. Williams, Pres., Seneca and Central Sts., will soon award contract for a 2 story foundry. R. Stormer, Seneca and Center Sts., Engr.

R. I., Newport—Short Line Bus Co., W. H. Vanderbilt, Pres., is having revised plans prepared for the construction of a 1 story bus terminal on Spring St. Estimated cost $50,000. E. M. Corbett, 167 Bedford St., Fall River, Mass., Archt. Noted May 29.

Tenn., Memphis—Shelby County, E. W. Hale, Comr., is having plans prepared for improvements to workhouse including machine shop, etc. at Mullins Station. Estimated cost $200,000. Hanker & Cairns, 123 South Court St., Archts.

Tex., San Antonio—U. S. Government, A. W. Bobins, Commanding Officer, plans the construction of a group of depot shop buildings at Duncan Field near here. Estimated cost $300,000.

Wash., Seattle—Hedlund Western Lumber Co., D. A. Hedlund, Pres., has work under way on a lumber mill, 80,000 ft. daily capacity including dock facilities, etc. at Duwamish Waterway. Estimated cost $200,000.

W. Va., Clarksburg—Weirton Steel Co., J. C. Williams, Pres., Weirton, plans complete electrification of tinplate plant here. Estimated cost $250,000.

Wis., Lake—Wrought Washer Co., 465 Ba St., Milwaukee, is receiving bids for 65 x 50-ft. rolling mill, 65 x 385 ft. storage house and 100 x 250 ft. shipping department on Oklahoma St. here. Klug & Smith, 69 East Wisconsin Ave., Engrs.

Ontario—Crucible Steel Co., 17 East 42nd St., New York, N. Y., plans the construction of a steel mill in the vicinity of Hamilton or Toronto. Estimated cost to exceed $1,000,000. Maturity indefinite.

Ont., Toronto—Bd. of Education, 165 College St., will soon award contract for a 3 story addition to Earl Beatty school including manual training room, etc. Estimated cost $175,000. E. Dyson 155 College St., Archt. Noted Oct. 2.